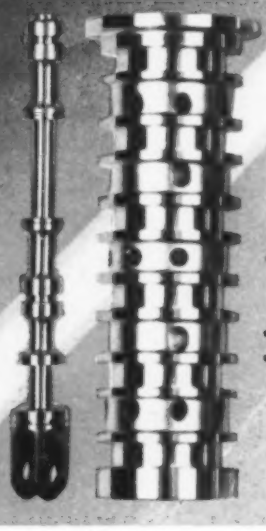
A HITCHCOCK PUBLICATION

Grinding and Finishing

JUNE 1961 • 50 CENTS



ABRASIVE MACHINING in the Space Age

also in this issue:

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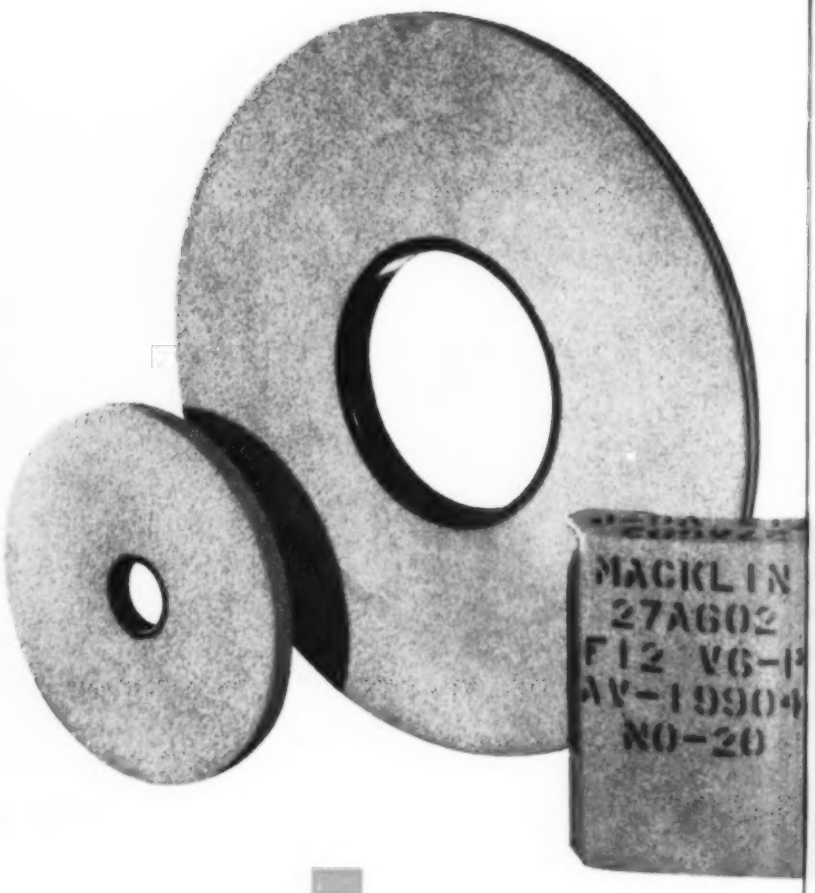
New Macklin

"27" Abrasive



Gives Premium Results at Regular Price*

"27" Abrasive wheels, the latest product in Macklin's continuing research and development program, is an aluminum oxide abrasive that consistently outperforms premium priced abrasives on many applications. It is ideally suited for a wide variety of operations from surface grinding boiler plate with segments, to precision grinding aircraft parts and very critical crush form work.

"27" is not a mixture of abrasives with diametrically opposite properties. Rather, it is a carefully manufactured abrasive with premium qualities . . . available to you at non-premium cost.

"27" wheels provide rapid stock removal. Can be used for heavy feeds on a wide variety of materials from tool steel to boiler plate.

"27" wheels grind exceptionally well. Provide fast cutting action, and require a minimum of dressing. Form holding qualities are excellent.

Want proof? Then read the actual case histories on the right. Then arrange for a demonstration with your nearest Macklin distributor or call us for the services of a Macklin field engineer.

*in suitable ordering quantities

"Wheels of Profit"

Surface Grind Boiler Plate
20"x4"x8" REC 2/S 27A46 I12 V6-P
"Wheel cut extremely well. Life excellent. Operator liked wheel."

Surface Grind 1010 Mild Steel
20"x5"x16½" CYL 27A46 H12 V6-S
"Wheel produced full load without any scratching."

Regrind Cutting Tools, M-1 and M-2 Steel
24"x2¾"x10½" REC 2/S 27A46 L+5 V6
"Wheel life best ever used. More pieces ground per wheel."

Surface Grind Die Cast Machine Parts
6 13/16"x1½"x5" STG SEGMENT
H12 V6-P 27A24
"Wheel very satisfactory. Cut well. Almost doubled life over competitive wheel."

MACKLIN company Dept. 9 Jackson, Michigan

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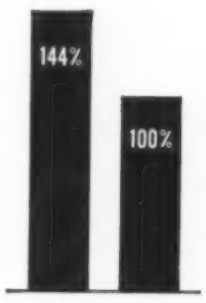
The Payoff is Performance

G-E Man-Made diamond bats 1.000 against high costs

Do you want to *do* something about high costs . . . boost your grinding efficiency . . . step up output per wheel?

Grinding wheels with G-E Man-Made diamond are making important contributions to the metalworking industry. An on-the-job test would show you that the crystal characteristics of controlled shape and friability that are built into G-E Man-Made diamond result in consistently superior grinding performance—bat 1.000 every time!

Do this. Call your grinding wheel supplier and order a wheel containing G-E Man-Made diamond. Test it in actual production in your own shop. You'll see what we mean.



A carbide cutting tool manufacturer — grinding single-point carbide tools — compared 6" x ¾" x 1¼" plain cup wheels, vitrified bond, 120 grit, 100 concentration — dry grinding. In this actual case history the natural diamond wheel removed 37.1 cubic inches of carbide, whereas the wheel containing G-E Man-Made diamond removed 53.4 cubic inches. Superiority of G-E Man-Made over natural? 44 per cent!

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CARBOLOY® CEMENTED CARBIDES • MAN-MADE DIAMOND • MAGNETIC MATERIALS • THERMISTORS • THYRITE® • VACUUM-MELTED ALLOYS

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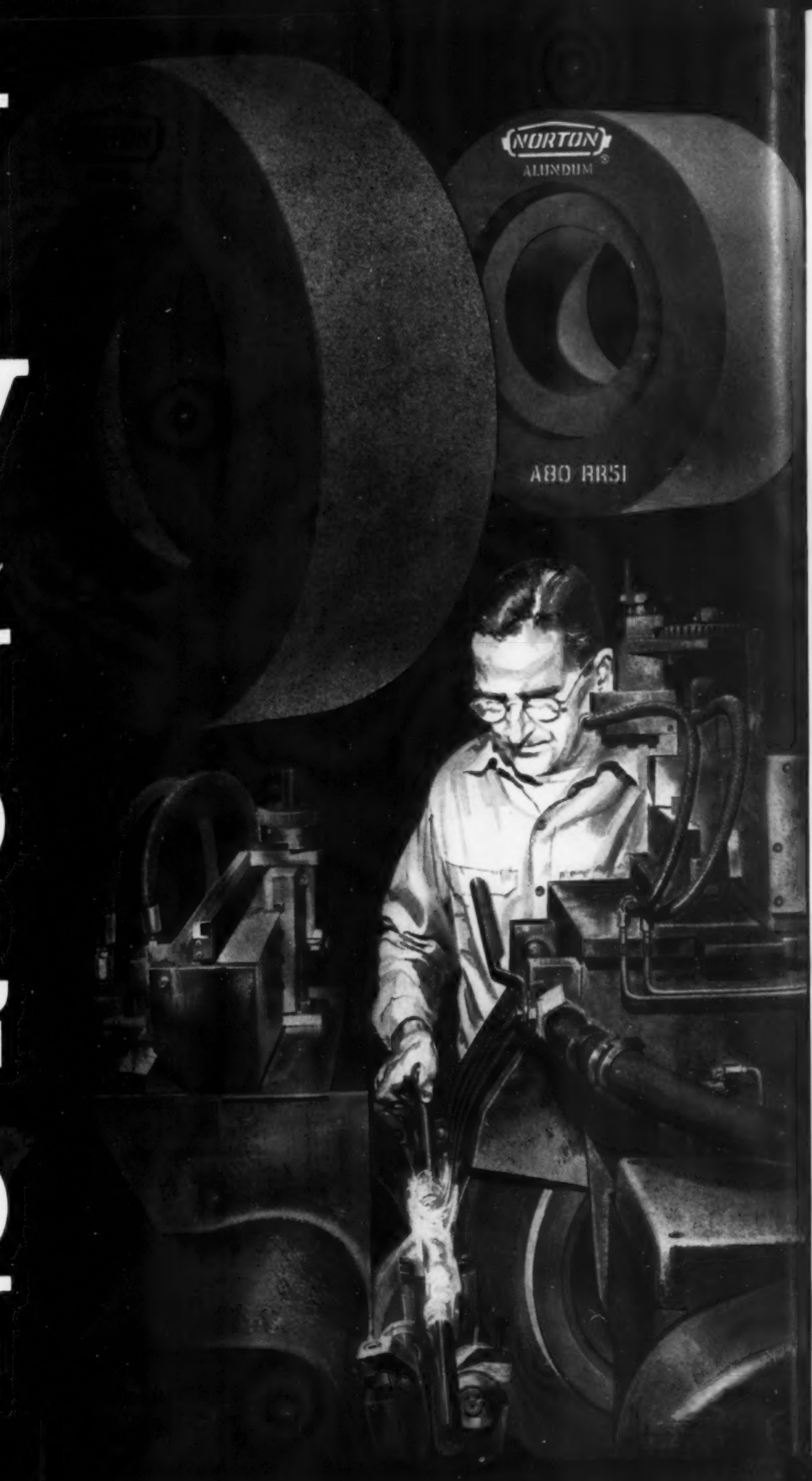
NEW *from* NORTON



The top-ranking wheel team for centerless grinding

The 23 ALUNDUM grinding wheel and R51 feed wheel . . . the best performing, longest lasting combination on any centerless grinder.*

Although centerless grinding is a two-wheel operation, it doesn't need to be a two-brand buying chore.

HERE'S WHY.

Norton now offers this outstanding wheel team for production-precision and economy in centerless grinding . . .

- *The 23 ALUNDUM grinding wheel for premium performance at non-premium price.*
- *The R51 bond feed wheel for positive feed and accurate work support plus long service life.*

23 ALUNDUM Abrasive is no ordinary aluminum oxide. In price it is *non*-premium . . . but with *premium* toughness and sharpness . . . and fast, free cutting action that means *premium* performance.

23 ALUNDUM wheels have other important advantages: friability, which minimizes dressing . . . uniform duplication, for uniform performance . . . and versatility, for grinding all steels, Meehanite, aluminum and many other metals.

Teammate R51 is not just another feed wheel. This special Norton abrasive-and-bond combination has thoroughly proved the importance of the feed wheel to accurate, low-cost centerless grinding.

Reports from plants all over the country credit R51 wheels with exceptional performance, minimum dressing and no slipping or chatter. And Norton quality control keeps them uniform from wheel to wheel and lot to lot.

On the new Norton No. 2 Straddle-Bearing Centerless Grinder — or on any other machine of this type — 23 ALUNDUM grinding wheels and R51 feed wheels make your best matched team for low cost, volume production centerless grinding. For expert aid in wheel selection, and a test run in your plant, see your Norton Man, a trained Abrasive Specialist, or your Norton Distributor, NORTON COMPANY, General Offices, Worcester 6, Massachusetts. Plants and distributors around the world.

*Trade Mark Reg. U.S. Pat. Off. and Foreign Countries

NORTON
ABRASIVES

W-2011

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Why let long-established habit dictate your selection of grinding wheels?

Sure, the grinding wheels you've always used may be doing the job, *BUT . . . is that job good enough* in today's cost squeeze? Let Simonds help *you* update *your* grinding practices. Complete line, available through Simonds distributors, includes wheels of all abrasives and bonds, all sizes and shapes . . . all industrially-renowned products, in efficiency-proved specifications . . . and backed by our 60 year reputation as a top-rank producer of abrasive grain and grinding wheels. Send for complete descriptive catalog.

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DIVISION OF SIMONDS SAW AND STEEL CO.

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Grinding the Space Metals: An Air Force Research Report

Grinding and Finishing

For Better Production and Finishing with Abrasives

VOLUME 7, NUMBER 6 JUNE, 1961

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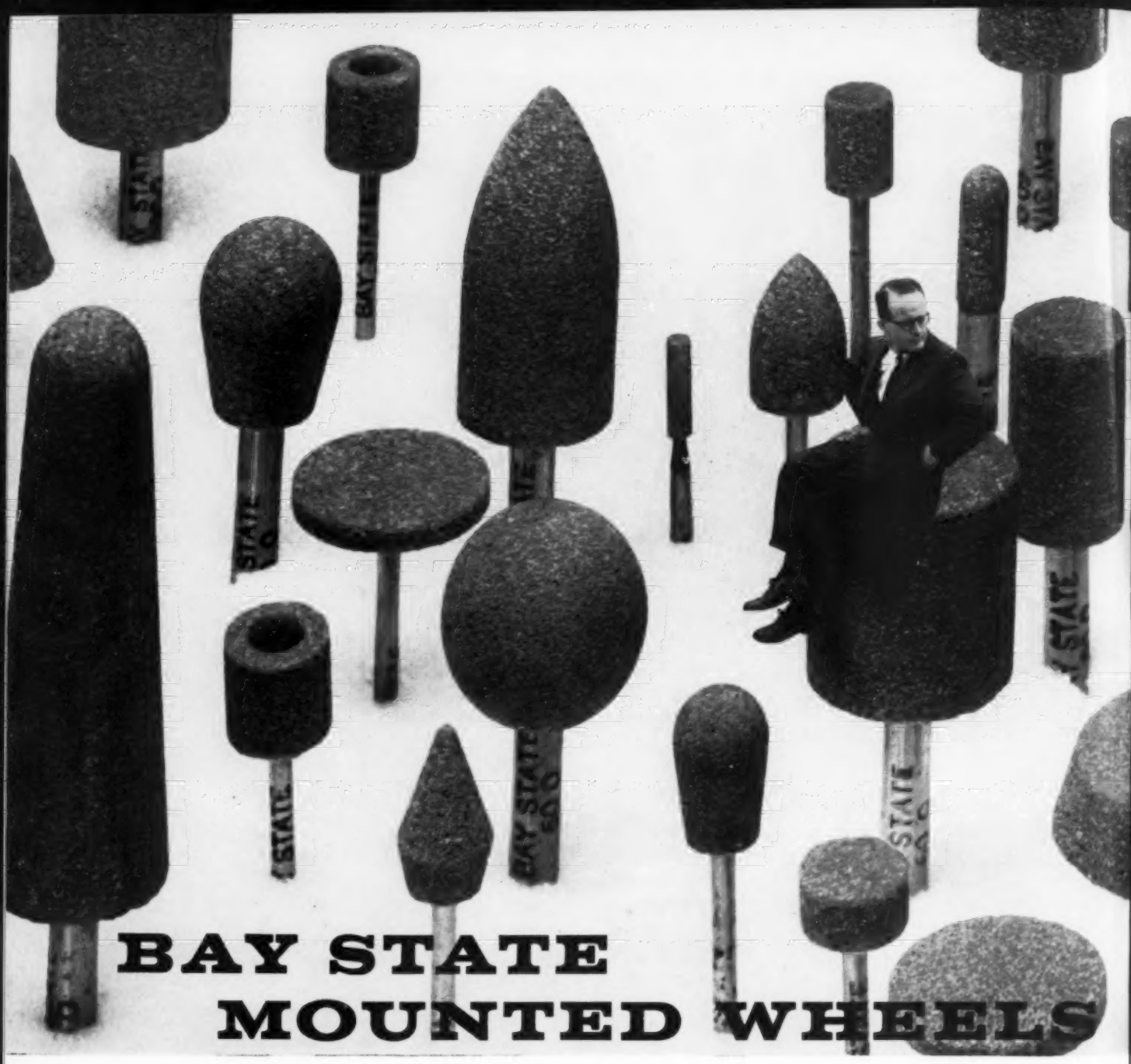

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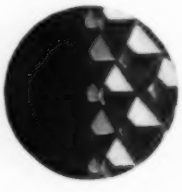
set a new standard

Bay State has just completed a concentrated research and engineering program designed to make Bay State mounted wheels the finest available anywhere. Results are paying off for users in more uniform grinding action . . . easier operation . . . and virtually complete elimination of defective materials and workmanship. These wheels are as nearly perfect as the most advanced abrasive technology can make them.

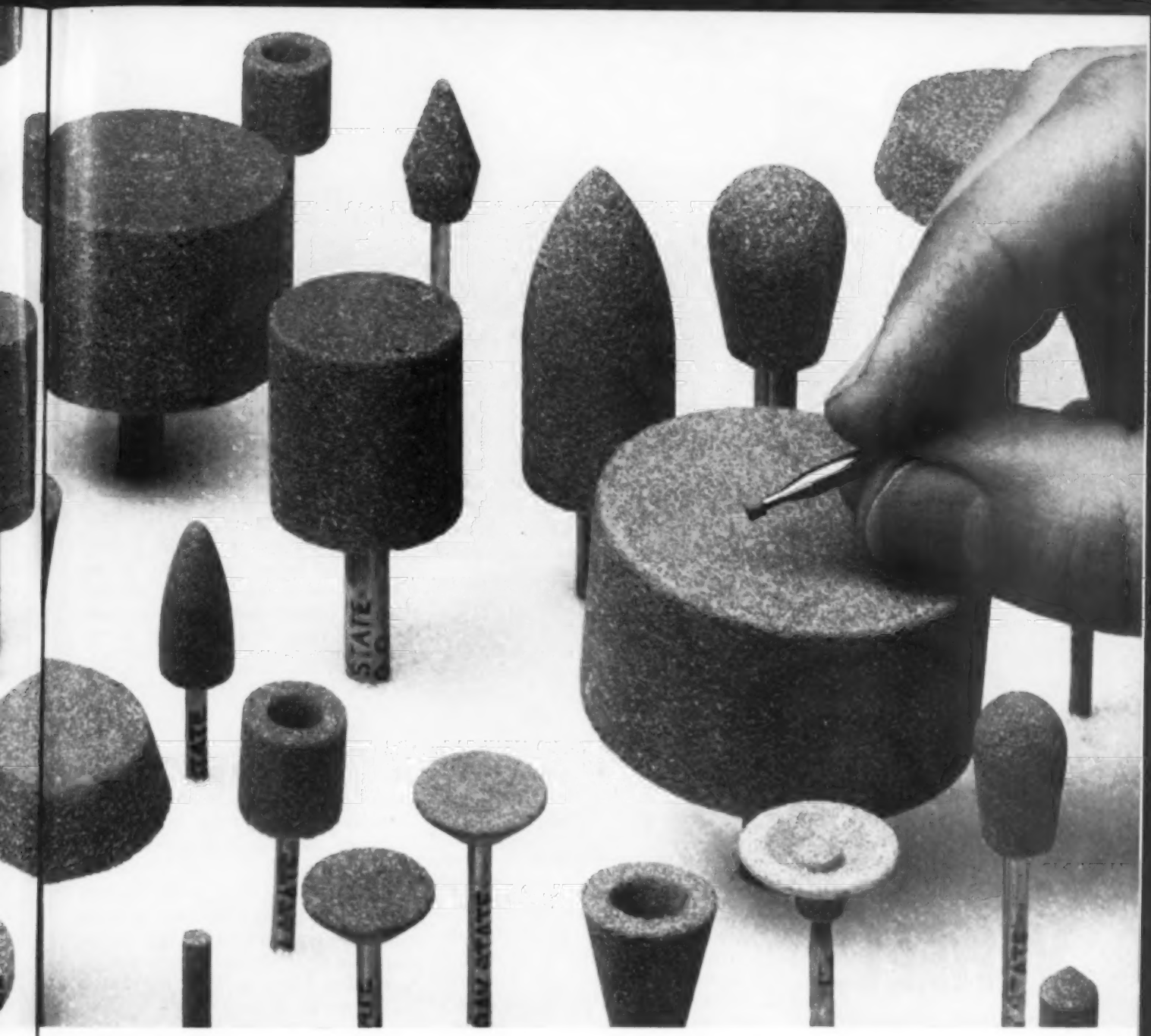
POSITIVE WHEEL-TO-MANDREL BOND Deeply knurled mandrel ends and specially formulated bonding material weld wheel and mandrel into a single, rock-solid unit. Constant, rigid quality control tests are made to check this Bay State feature.



SUPER-ACCURATE CONCENTRICITY Every wheel is molded oversize and then *ground to shape on its own mandrel* so that it *automatically* becomes perfectly symmetrical and is perfectly concentric with the center of the mandrel itself. *Result:* Every wheel runs true from start to finish . . . no breaking in required . . . no hard spots, no soft spots, the whole wheel does a 100% job of grinding right down to the mandrel.

BAY STATE
WHEELS of PROGRESS

BAY STATE



# of excellence for the industry

MAXIMUM MANDREL UNIFORMITY Mandrel diameters are uniform to very close tolerances. No fumbling when operator changes wheels because new wheels can be locked into place with a minimum change in the collet or chuck setting.

COMPLETE INVENTORY IMMEDIATELY AVAILABLE Hundreds of different combinations of shape, grit, size, porosity, bond and mandrel size are in stock, ready to be shipped to users immediately. Bay State's 30-page catalog makes it simple to choose the specs you need for any job.

For special mounted wheels, call your Bay State, direct or distributor, representatives. They are abrasive specialists. *Better grinding at lower cost . . . that is their business.*

Bay State Abrasive Products Co.
Westboro, Mass.

Please send me the new Bay State Mounted Wheel catalog with full technical information on the best mounted wheels available to industry.

Company _____

Name _____

Address _____

City _____ *State* _____

ABRASIVES

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Branch Offices: Chicago, Cleveland, Detroit, Los Angeles, Pittsburgh. *Distributors:* All principal cities.

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U. S. Patent 2,942,387

DIAMOND WHEELS

FIRST NEW CONCEPT IN ABRASIVE TECHNOLOGY IN TWENTY-FIVE YEARS.

Revolutionary new styling with vanes that cool the abrasive section and strengthen the wheel . . . adds wonderful new high performance level with

PRESSURELOK®

The Performance Bond; proved best by the largest Aircraft and Automotive industries. Works excellently in either wet, mist or dry grinding. . . . and they are self-dressing.

New TURBOGRIND Diamond Wheels are immediately available from distributors, or write for complete information.

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Editor's Mail

MORE ON STATE SAFETY CODES: CALIFORNIA

Thank you for sending me the copy of your editorial and of the article, "Facts on State Safety Codes."

I have enclosed a copy of an excerpt from the June 1953 CALIFORNIA SAFETY NEWS which describes how our safety orders are developed.

When California's General Industrial Safety Orders were drafted in the 1940's, the American Standards Association's regulations were reviewed and parts of them were adopted for inclusion in the new Orders.

However, since these Orders have the effect of law and because the adoption of the American Standard in its entirety was not deemed practical, the Division adopted the Orders as they now appear. A copy is being mailed to you under separate cover.

These Orders have been in force since January 1950, and because they have been both enforceable and acceptable they have been successfully used in accident prevention work in California.

However, I note that ASA B7.1 has been revised several times since our Orders were adopted. With this in mind, I will ask Mr. John F. Henning, Director of the Department of Industrial Relations and Chairman of the Industrial Safety Board, to carefully consider the American Standards at the time of the next revision of the General Industrial Safety Orders.

Sincerely,

EDMUND G. BROWN, Governor

Mr. Brown makes some very persuasive points regarding safety regulations in California. Their procedure as outlined in the article enclosed with his letter is certainly very democratic. One might question, however, whether it is much more flexible and responsive than the "cumbersome and unwieldy process," as the article terms it, of having legislatures write safety codes.

The 1953 study by the U.S. Department of Labor, mentioned in the article, made an extremely detailed study of individual provisions both in the 1947 ASA Code and in the state regulations.

Eighty provisions in eleven sections were listed by ASA.

Of these, 18 were covered by the California Orders—one was more restrictive, ten equivalent, and seven less restrictive. Lacking a formal revision by the state, it does not appear that the situation is much different now.

At the same, it is always possible that the existing Orders are accepted and enforced in such a way as to reduce the frequency and severity of grinding wheel accidents and that is the goal of all such efforts.

NEW ARTICLE PRESENTATION

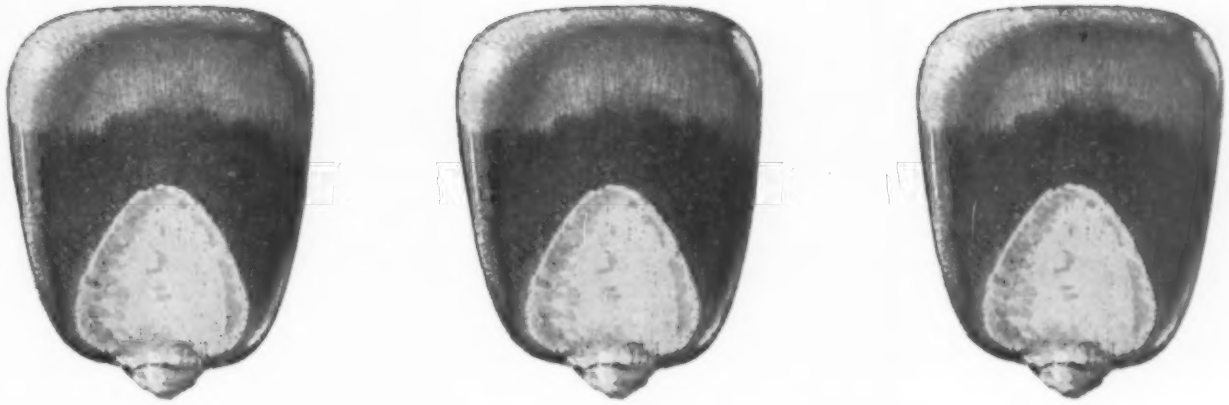
From the standpoint of the reader, most magazines are too large and say too little.

You have hit a very responsive note with me in outlining the basics of each article in a simple, concise manner.

Please continue this policy.

Very truly yours,
John P. Gaeth
Vice President and
Treasurer
The Osborn Manufacturing
Company

Thank you. We plan to do so.



POSITIVE DUPLICATION—EVERY TIME!

Each one of these kernels of corn has positive duplication built into it, just as have these internal wheels, and *all* CINCINNATI (PD)° GRINDING WHEELS. There are good reasons for this (PD) dependability . . . 36 good reasons.

FAMOUS, UNIQUE PROCESS

Three dozen unvarying quality controls govern every step of the famous Cincinnati (PD) manufacturing process, unique in the industry.

For example, the atmosphere of the mold room is *climate controlled* with conditions of temperature and humidity that *remain the same* from hour to hour, from day to day, from year to year!

RESULT: UNSURPASSED UNIFORMITY

This extraordinary attention to manufacturing detail results in wheels of unsurpassed uniformity. You can reorder CINCINNATI WHEELS with confidence, because they give you the same good job time after time. You use fewer wheels because (PD) wheels last longer.

CALL CINCINNATI TODAY

Factory trained by the Cincinnati Milling Machine Company, our grinding specialists are available to you for consultation on all your grinding problems. Call your CINCINNATI GRINDING WHEELS Distributor, or contact us direct, Cincinnati Milling Products Division, Cincinnati 9, Ohio.

(PD) POSITIVE DUPLICATION

CINCINNATI°
GRINDING WHEELS

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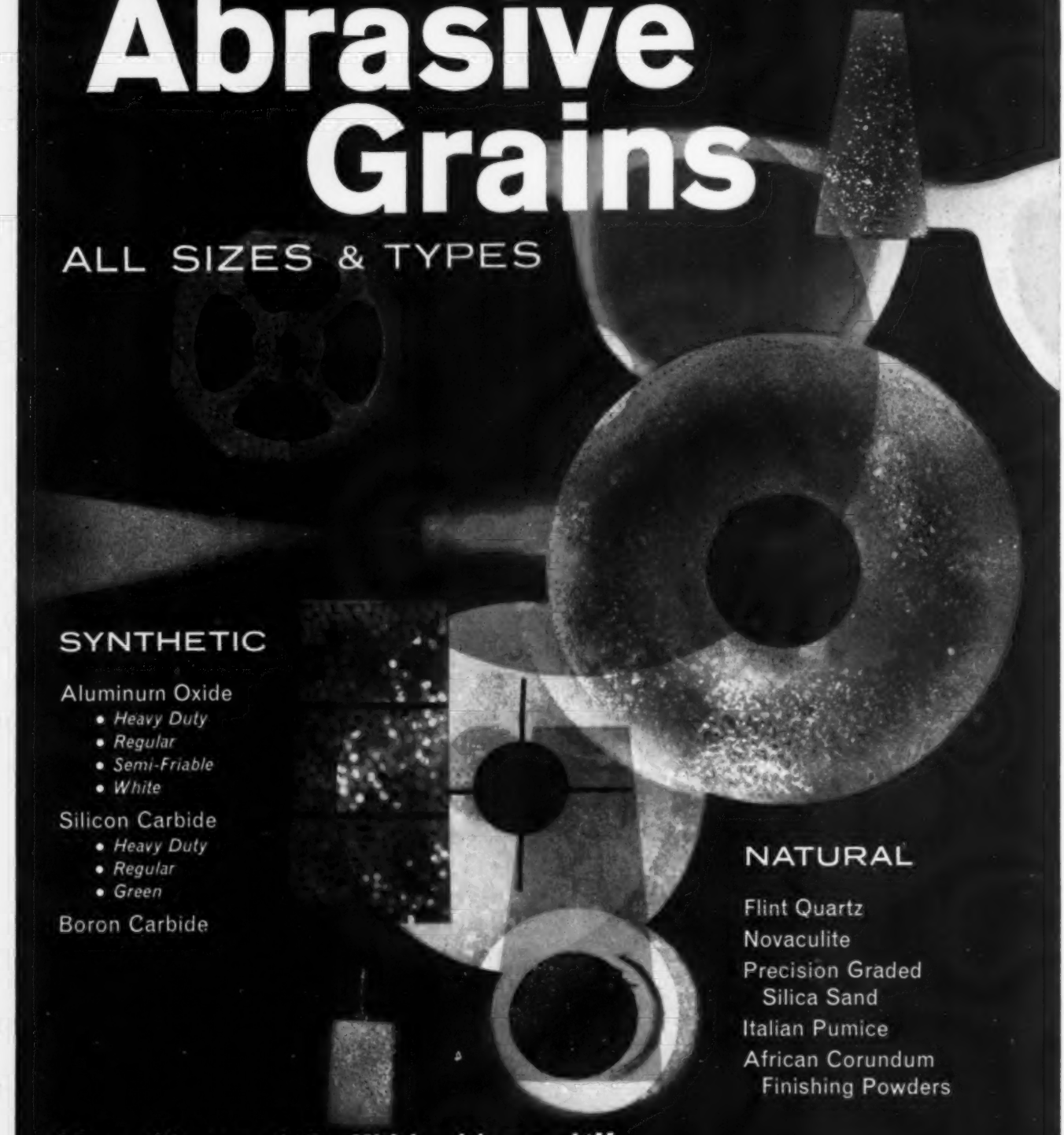
Abrasive Grains

ALL SIZES & TYPES



SYNTHETIC

Aluminum Oxide
- *Heavy Duty*
- *Regular*
- *Semi-Friable*
- *White*

Silicon Carbide
- *Heavy Duty*
- *Regular*
- *Green*

Boron Carbide

NATURAL

Flint Quartz
Novaculite
Precision Graded Silica Sand
Italian Pumice
African Corundum
Finishing Powders

You Name It? "We Have It"

For immediate shipment from stock

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REDUCE DOWN TIME

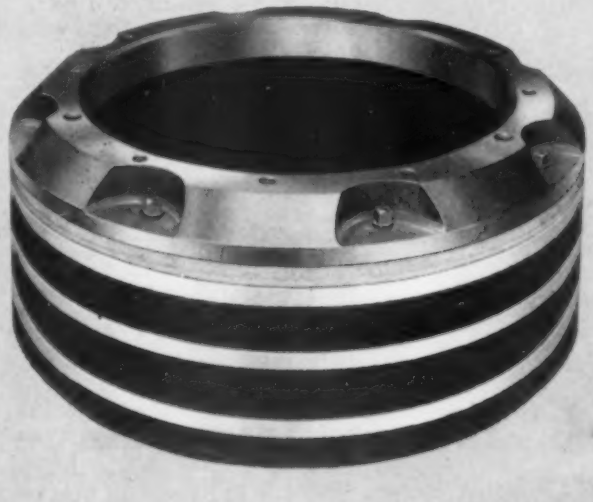
with Gardner tape bound cylinder wheels

continuous, uninterrupted production

eliminates operator hazard

higher strength with tapes an integral part of wheel

Glass fibre tapes grind away as wheel wears . . . eliminate production stoppages required for removal of wire binding.



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abrasive discs

BELOIT, WISCONSIN

Suddenly complex finishing has a simple solution!

The Pangborn Vibratory Finishing Machine has an unusually wide range of applications. What would you like to descale, deburr, radius, finish or burnish?

Metal and metal alloy as well as many plastic and ceramic parts may be vibratory finished. This machine processes extremely small and delicate items with the same facility it handles large and heavy objects.

What's more, the Pangborn Vibratory Finishing Machine performs as much as 100 times faster than conventional equipment. Cuts costs? You bet!

All sizes of the machine come equipped with variable speeds and amplitudes plus new improved air-cushioned suspension. Optional air-cushioned floor mounts completely eliminate any transmission of vibration to the floor. Auxiliary equipment and the best in media and compounds are available for your every need. Send parts with exact finish specifications or finished specimen for sample processing in our laboratory to Mr. William E. Brandt at:

PANGBORN CORPORATION, 820 Pangborn Blvd., Hagerstown, Md.; Pangborn Canada Ltd., 47 Shaft Rd., Toronto (Rexdale), Canada; *—Manufacturers of Vibratory Finishing, Blast Cleaning, Dust Control Equipment—Rotoblast® Steel Shot and Grit®.*

Pangborn

OF HAGERSTOWN

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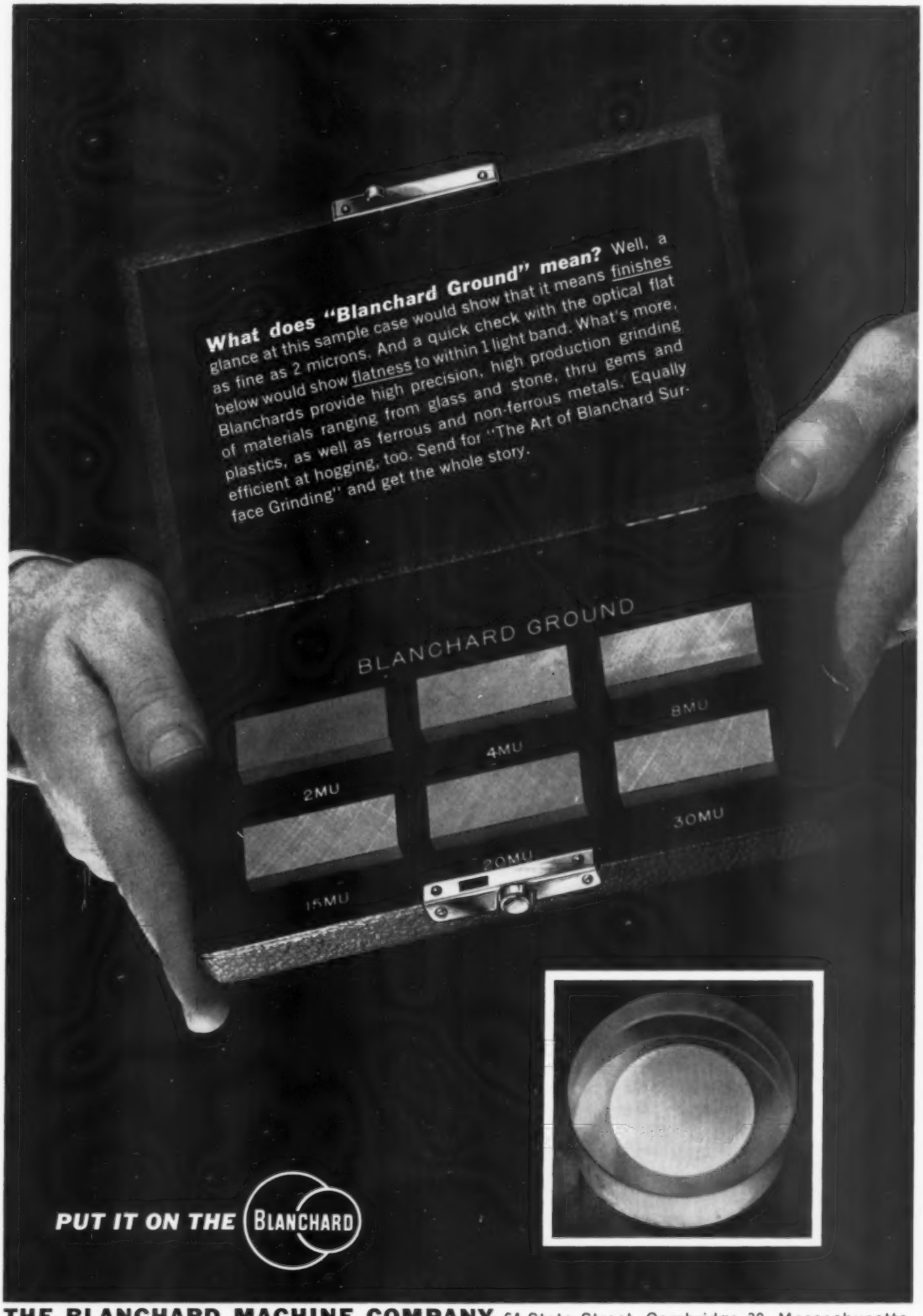
What does "Blanchard Ground" mean? Well, a glance at this sample case would show that it means finishes as fine as 2 microns. And a quick check with the optical flat below would show flatness to within 1 light band. What's more, Blanchards provide high precision, high production grinding of materials ranging from glass and stone, thru gems and plastics, as well as ferrous and non-ferrous metals. Equally efficient at hogging, too. Send for "The Art of Blanchard Surface Grinding" and get the whole story.
BLANCHARD GROUND
2MU
4MU
8MU
15MU
20MU
30MU
PUT IT ON THE BLANCHARD

THE BLANCHARD MACHINE COMPANY 64 State Street, Cambridge 39, Massachusetts

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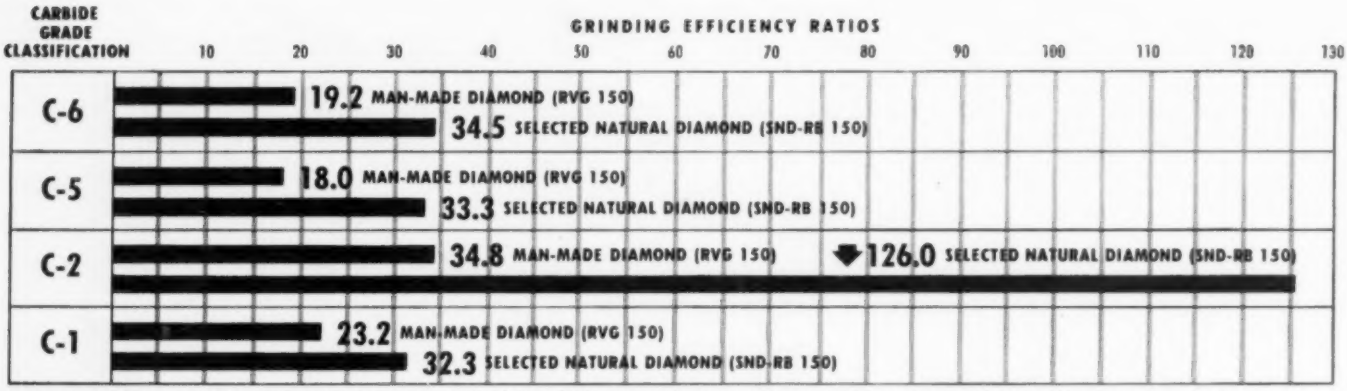
In toughest carbide grinding, SND (Selected Natural Diamond) delivers minimum of 40% longer wheel life!



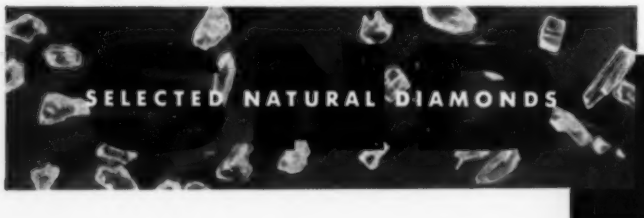
TEST CONDITIONS—Wet Grinding • **WHEELS:** DIAI Peripheral (5" x 3/16" x 1 1/4") • **SPINDLE SPEED:** 4200 RPM. (5500 S.F.M.) • **DOWNFEED:** .002" • **CROSSFEED:** .042"

SND (Selected Natural Diamond) outgrinds man-made diamond *on every carbide grade you use*—for unequalled savings in wheel and production costs! The unique performance capabilities of SND—the most advanced development of diamond technology—are demonstrated conclusively by extensive evaluation tests in precision grinding operations.

This chart shows how emphatically SND outscores man-made diamond, even in toughest carbide grinding procedures—grinding with up to *262% greater efficiency on C-2 carbide . . . with 40% greater efficiency on extremely hard C-1 carbide*. These performance results are the reasons why SND can insure longer wheel life, greater wheel output for maximum surface grinding economy.

Discuss SND with your diamond wheel representative. He has the useful experience and information to help you select SND in the diamond wheel best suited for your production requirements.

For information on new developments in precision grinding with industrial diamonds—including test results proving SND superiority—write for Engelhard Hanovia's technical bulletins.



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INDUSTRIAL DIAMOND DIVISION
113 ASTOR STREET • NEWARK 2, NEW JERSEY

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Cut metal cleaning costs with blasting

Pressure blasting with Norton ARROW-BLAST abrasive will save money every step of the way on most of your metal cleaning jobs — because of the high cutting efficiency and longer life of ARROW-BLAST grain. Composed of fused alumina grains that are tough, hard and sharp, ARROW-BLAST abrasive has high resistance to breakdown so that it can be used repeatedly through several cleaning operations. And unlike sandblasting, dust is negligible with ARROW-BLAST abrasive eliminating poor visibility and other hazards.

Norton NORBIDE* pressure blast nozzles add even more to the savings picture. Molded of boron carbide, the man-made material that's next to diamond in hardness, these nozzles have proven over and over that they have much lower overall operating cost than so-called "inexpensive" nozzles. NORBIDE nozzles cut costs right down the line — in replacement . . . operator downtime . . . air consumption.

An informative new report from Norton entitled "Pressure Blasting with Manufactured Abrasives," gives many details and operating facts about this efficient and economical metal cleaning process. For your copy, write NORTON COMPANY, General Offices, Worcester 6, Mass.

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"3M" TYPE "C" DISCS CUT GRINDING TIME 1/3!

At a 3M representative's suggestion, Mastercraft Metals, Inc., Bellevue, Ky., a leading manufacturer of stainless steel kitchen equipment recently switched from a competitive brand to 3M Type "C" Discs for grinding welds. The result: a ⅓ reduction in grinding time . . . and Type "C" Discs produce a finer scratch pattern that allows easier, faster blending to the final finish.

COST CHECK 5-4-5

Why not let 3M's new COST CHECK 5-4-5 Program help you to effectively investigate ways to lower costs and increase profits. Discover . . .

- If your grinding can be done more economically
- If your finishing is as efficient as possible
- If your polishing can be done faster and better

Send today for a free COST CHECK 5-4-5 Review Form without obligation. Put 3M's years of abrasive know-how at your disposal. Write: 3M Company, 900 Bush Ave., St. Paul 6, Minn. Dept. No. AAH-61.

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now...
a finer, faster
finishing touch
created by three-dimensional vibration

The unique action of media in the New SWECO Vibro-Energy Finishing Mill literally "reaches around corners" to deburr and finish all surfaces better and quicker than ever before possible. The reason: highly efficient energy conversion to media and parts in work via high-frequency, yet gentle, three-dimensional vibration. The SWECO Vibro-Energy technique has been used for many years in the accurate separation of thousands of screenable materials. Also, Vibro-Energy has been successfully applied to ultra-fine (sub-micron) wet-grinding and dispersion. Following extensive development and field testing, SWECO Vibro-Energy now brings important economies and advantages to deburring, finishing, polishing, coloring and burnishing. An illustrated technical paper describes the principle and profit potential of this new SWECO application to metal, ceramic and plastic parts. A copy will be mailed promptly at your request. Write SOUTHWESTERN ENGINEERING COMPANY, 4800 Santa Fe, Dept. 86426 Los Angeles 58. *Vibro-Energy Separators, Grinding Mills, Finishing Mills*

SWECO

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Abrasive Engineer's Corner

ARTHUR RAKESTRAW • Contributing Editor

SQUARE FACES ON DIAMOND WHEELS

• How do you maintain square faces on diamond wheels?—E. L., Anniston, Alabama.

If this is a constantly recurring problem, I would suggest the purchase of a brake-controlled diamond wheel truing device. These are designed to take care of conditions such as you have reported.

There are several types available, with a rather wide range in price. Basically the unit consists of a silicon carbide vitrified wheel mounted on an arbor and supported at one or both ends by heavy-duty bearings.

One device is designed with a brake to control the speed with which the truing wheel revolves on contact with the diamond wheel.

The other has the truing wheel set at an angle in order that its rotation provides a shearing action at a reduced speed. Either of these devices is applicable to cylindrical or surface grinding machines.

The usual practice is to mount the diamond wheel collet and wheel on a surface grinder spindle. The truing device is mounted immediately below, on a magnetic chuck.

Then the diamond wheel is fed downward, making light contact with the wheel of the truing device. Rotation of the truing wheel, which wears at a ratio of about 10:1 (truing wheel to diamond wheel) will restore the diamond wheel face to its original flat condition in a very short period.

Prior to the advent of these truing devices it was common practice to mount a 6″ x ½″ silicon carbide wheel, 80 grit, M grade, on an arbor between centers on the table of a tool and cutter grinder. The diamond wheel to be trued was mounted on the machine spindle.

The table was fed into the diamond wheel, making light contact. One hand was applied to the truing wheel arbor to control its revolution, allowing it to turn sufficiently to round up as it dressed. It was possible to restore the flat diamond wheel face, but the operation required some set-up time.

CHECKING CONCENTRICITY IN CENTERLESS FORM GRINDING

• I'd appreciate your giving me some tips on centerless form grinding.—A. I., Providence, Rhode Island.

The most commonly used method of checking centerless ground work for roundness or concentricity is by use of a V-block and an indicator.

All centerless ground work has a constant diameter, but not necessarily round. Diametrical measurements will not detect the out-of-round condition. By rotating the ground part in a V-block, with an indicator placed directly above, any out-of-round condition can be immediately noted.

Your difficulty may come from improper machine set-up. The center of the work should be elevated above the center line of the grinding and regulating wheels. In many instances, the height of the work is such that a hold-down bar is necessary to keep the work from popping out.

For perfect roundness, it is imperative to set the work rest so that the work center is above the wheel centers.

"He designs the work holding fixtures for our surface grinders."

SURFACING PIERCED PANELS OF STEEL, ALUMINUM

• What equipment and abrasive would you recommend for belt surfacing of pierced instrument panels of aluminum and steel?—H. H., Silver Spring, Maryland.

Generally speaking, panels such as you describe could well be surfaced on a flat belt polishing machine with an 80 grit aluminum oxide abrasive belt. In surfacing the aluminum, some stick compound of a very low melting point should be applied to the belt to insure free cutting without belt loading.

The flat surfacing operation would leave some burr at the edges of the perforations at the entering side, which can be removed with a combination brush and abrasive wheel head.

Round perforations are sometimes deburred with slotted abrasive discs mounted on an air grinder. Both vibration and barrel finishing have also been used for deburring.

Your final choice of equipment, of course, will depend on such factors as the size of the panels, the number and location of the holes, the tolerances and allowable burr, and the production level. I'd suggest that you contact one or more of the manufacturers of flat belt surfacing machines, giving them full particulars as to size of panels and results expected. They can give you engineering advice. • • •

QUESTION OF THE MONTH

Question: Are Kuzmick "Ace of Diamonds" wheels limited as to SIZE?

Answer: NO—We manufacture any diamond wheel in any bond in a continuous rim as large as 42" diameter. Such standards are our specialty.

TRADE MARK
THE P.L. KUZMICK CO. VERONA, N.J.

THE PAUL L. KUZMICK COMPANY
271-279 Grove Ave., Verona, N. J.

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Fiat machine shops adopt an American coolant

● The case history of the current use of an American product in an outstanding overseas metalworking complex reveals one way by which United States manufacturers are penetrating foreign markets. Clyde A. Sluhan, president of Master Chemical Corporation of Toledo, Ohio, flew a fast trip to Italy (the week of April 10) to make sure that the Fiat plants in Turin would get all the advantages inherent in his product Trim®, an all-chemical coolant manufactured by the Toledo concern.

An unexpected requisition for a 55 gallon drum of the coolant to be shipped by air and a following shipment to be sent by sea originated when the specifications of a parts order received by the Fiat Aviation Division requested that the machining of the units be done with Trim. The parts are being made by Fiat under order from a large U.S. aircraft jet engine builder, for use in aircraft being supplied to the European market. The same parts in the United States are being machined with Trim and the same procedures are being required of Fiat. The material being worked is stainless steel machined to extraordinary, close tolerances.

"The Fiat people are currently using 70 different brands of coolants and cutting fluids," says Sluhan, "and naturally were keenly interested in one with which they were not already familiar. Trim is made in 7 different formulas which can be used individually or tailor-blended for specific requirements to efficiently cover all modern machining and grinding operations. The Trim shipped to Fiat is our regular, general purpose product. It is possible that Fiat may find that they don't need 70 varieties.

"The Fiat executives and workmen were very courteous and avidly interested in any new and better methods or products the United States has to offer. The huge machine shop was filled with the most up-to-date lathes, milling machines, drill presses and grinders. They are doing a lot of high precision work in all metals and materials. I met technical men and supervisory personnel at the aviation plant and also the Fiat automobile plant with Sig Cavalleri, the assistant purchasing agent. One among them spoke English and it was a thrilling and interesting experience to find our own familiar work problems and situations there so far from home. The Fiat plants employ 80,000. They produce 22 different types of automobiles in their automobile plant. They are having our technical literature translated for their own use, as they have many and various machining and grinding operations. Their finished work is of the highest possible quality."

London welcomes international industrial finishers

By V. C. HOGREN, Publisher

London, England:

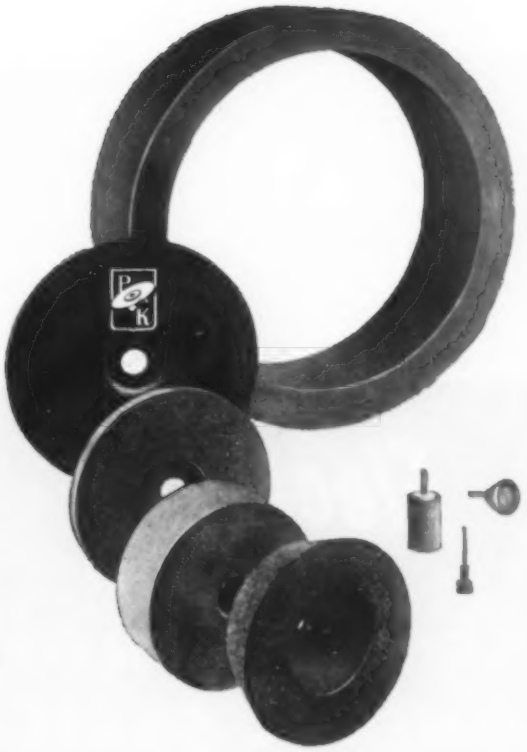
The first International Industrial Finishes Exhibition and convention took place in London, England, from May 8 through 11. Several thousand visitors came to Earls Court to view the 80 exhibits and listen to sixteen papers prepared and discussed by leading finishing authorities in Great Britain.

The majority of exhibits and papers were devoted to finishing by methods other than abrasive. Nevertheless, names familiar to American industry displayed their products through European affiliates. Among these were Carborundum, Engelhard Industries, Hammond, Esso, DeVilbiss, Diversey, Roto-Finish, Sundstrand (sanders), Graco (spray equipment), International Nickel, Turco, Ransburg and Magnus Chemical. Considerable interest was evidenced as exhibitors seemed pleased at the results in this first effort toward a truly international finishing meeting.

One of the papers presented was titled "Approach To Automatic Polishing" by R. A. Smith of B. O. Morris Ltd., British manufacturers of polishing and buffing equipment. He deplored the use of finishing departments as a means of correcting or covering up manufacturing defects. Hence, the necessity for standards and the current trend toward better quality dies and tools where the products are formed. Smith also touched upon design as a means of reducing both manufacturing and finishing costs.

"Problems of Dust In Finishing" presented by K. H. Watson of Anti-Dust Services, Ltd. made the interesting observation that the modern finishing plant often has severe dust problems whereas the old fashioned shop is practically dust-free. The reason, of course, is that newer plants with smooth, shiny surfaces have only wet finishes where dust can settle. The old plants have dust traps in such places as oil, grease and paint on floors and walls. Watson's solution is the use of dust barrier curtaining.

The convention and exhibition planned to be held annually was sponsored by Scientific Surveys, Ltd., 97 Old Brompton Road, London, S. W. 7.



QUESTION OF THE MONTH*

QUESTION: What is AGRABOND?

ANSWER: Agrabond is a combination resilient rubber-bond wheel having the metal removal qualities of a rigid resinoid wheel and the finishing properties of a flexible polishing wheel.

Want to know more with proven applications? Write for complete information on this revolutionary new concept in Grinding Wheels to:

*repeat of last month's question because more and more proven applications are falling into line. See next month's advertisement for listing of proven applications.

PEKAY ABRASIVES, INC.
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Electronic

INFEED GRINDER CONTROL SYSTEM

HOLDS WORK TO .0002" IN PRODUCTION QUANTITIES

(To .000070" On Parts Smaller Than ½")

Electronic unit continuously monitors position of slide relative to workpiece in order to obtain predetermined finished size . . . Variations in size of workpieces do not affect finished size . . . Compensation for wheel wear and variations in machine elements and operating conditions can be made without shutting down the machine . . . A single control knob permits adjustment for size while grinding is in process.

INCREASES OUTPUT OF EACH WORKER AND MACHINE

Pre-grinding operations are eliminated . . . Speed and ease of set-up reduces downtime.

CUTS DIRECT AND INDIRECT GRINDING COSTS

Higher production per machine and per worker and elimination of "rough grinding" time means that fewer grinders and fewer workers are required to maintain existing production requirements.

635C-3

The Bellows-Airborne Infeed Grinder Control System consists of a modified MICROtrol Control Unit, manufactured by the Airborne Instruments Laboratory division of Cutler-Hammer, Inc., linked to a special Bellows Grinder Feed. Designed primarily for use with a Cincinnati #2 Centerless Grinder in applications where the part is not ground over its entire length (such as headed pins, rounds or pins of divided diameters, or parts which cannot traverse between the wheels), the unit offers both coarse and fine feeds and can be set for either continuous cycling or single cycle operation.

For complete information, without obligation, write Dept. GF-661, Bellows-Valvair, Akron, 9, Ohio

Bellows-Valvair

AKRON 9, OHIO

DIVISION OF INTERNATIONAL BASIC ECONOMY CORPORATION (IBEC)

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Dateline: Industry's Economy

In the judgment of the Kennedy administration, current action in the tax field should meet three objectives: it should have a dynamic and immediate impact upon the improvement of our industrial base; it should maximize the investment impact for every dollar of tax loss; and it should have a counter-cylical effect in the light of current recession conditions. The Machinery and Allied Products Institute has submitted a program designed to help the administration meet those goals. The MAPI plan emphasizes the need for a bold and major program; the need for recognition of the widely different circumstances in which companies find themselves, and the need for prompt announcement of the program.

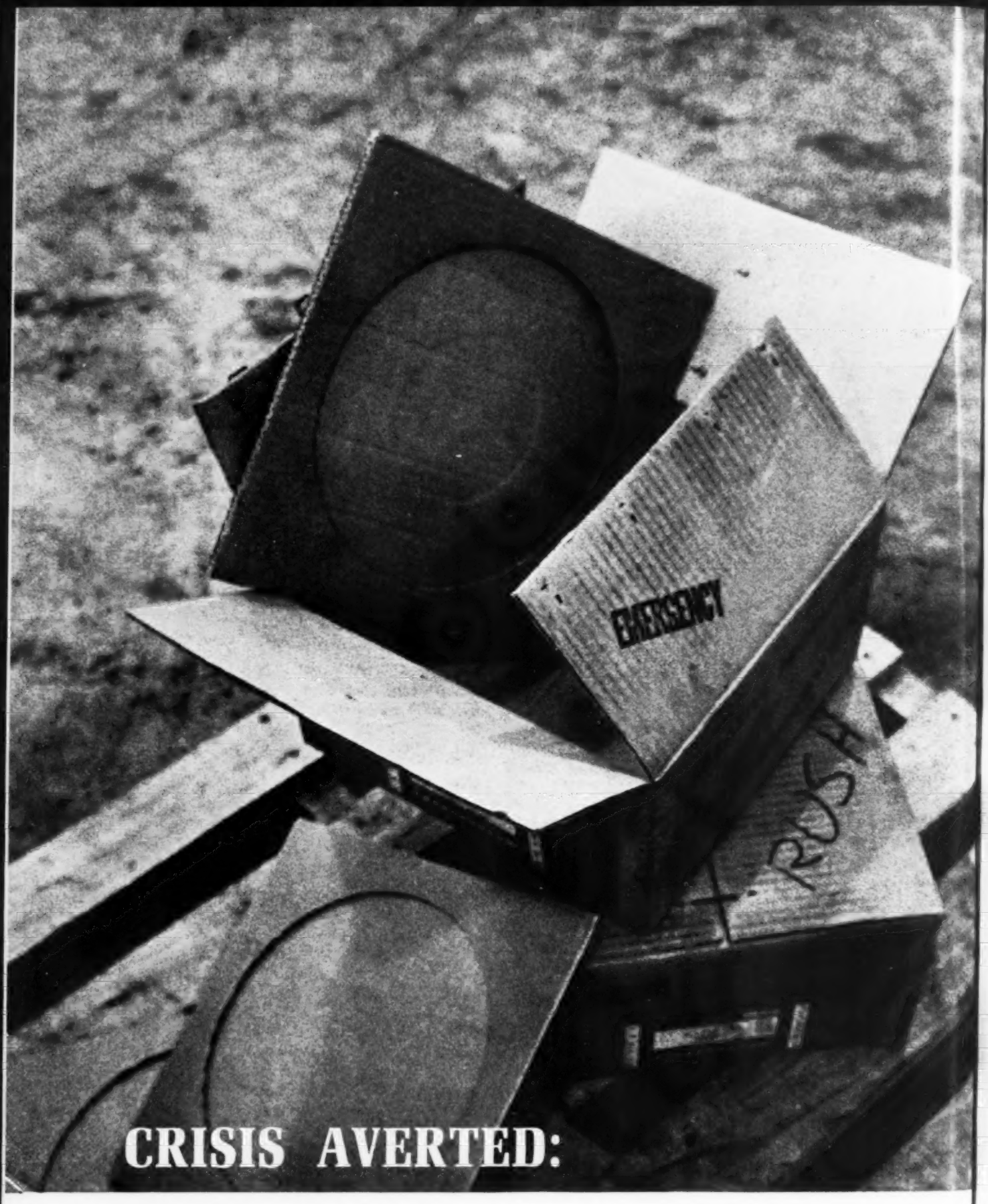
R. S. Stevenson, president of Allis-Chalmers Mfg. Co. announced that his firm expects improved results as the year progresses. He said retail prices of farm equipment began to improve during the first quarter and at the end of that period were running about 10% better than the same period the year before. In addition, dealers were showing their optimism by buying more goods.

Addressing the stockholders of the Beryllium Corporation at their annual meeting, President Walter R. Lowry pointed to competitive gains made by the company since its entry into the "government-controlled, one-company" beryllium metal industry since 1958. In 1960 record sales of $24,263,803 included $7 million worth of beryllium metal of which more than $6 million was in products from the fabrication plant. In 1959 beryllium metal sales were $3.25 million of which less than one-half million represented fabricated products. In that year, fabrication business was for the first time placed on a competitive basis by the Atomic Energy Commission.

The United States, in cooperation with other leading financial countries, should seek complete elimination rather than mere reduction of our balance as payments deficit, the Committee for Economic Developments (CED) Research and Policy Committee declared in May. Although there has been a decline this year in the unfavorable balance of payments which has exceeded $3.5 billion in each of the last three years, the Committee stressed that "the problem remains," and advocated specific steps to increase U.S. earnings overseas and to broaden foreign participation in defense and assistance programs.

A price reduction on catalog items of precision miniature ball bearings manufactured by New Hampshire Ball Bearings, Inc., took effect April 15. New prices, varying from 3% to 7% lower, apply to individual items ordered on or after that date. In making the announcement, Arthur N. Daniels, president, said, "This is away from a trend toward price increases exhibited by some manufacturing companies."

By trying to sell less steel per product unit, United States Steel Corp. can often increase its sales according to Howard J. Mullin, vice president—sales. Speaking before members of the Purchasing Agents Association of Detroit, Mullin pointed out that "by committing all the resources and experience of U.S. Steel, we can help our customers enhance their profit by enabling them to use less steel, but more efficient steel, per unit product. We believe that this is the way to help our customers increase their economic vitality, to help them achieve sound growth by being able to offer more value for the same money, or the same measure of value for less money—and for us to sell more steel over the long run."



CRISIS AVERTED:

Not every grinding wheel order springs from an industrial crisis, but when there *is* a hands-down emergency—when you're in a cross-fire of urgent demand that only an opened container on your shipping dock can satisfy—Carborundum's electronic order processing service can be your answer. By split-second Univac II control, Carborundum can instantly search a nationwide chain of warehouses for the item you need—place it under teletype order for air shipment—slam the door in the face of crisis. For your critical items . . . as for your everyday requirements . . . Carborundum is your key to superior abrasive service. **CARBORUNDUM**

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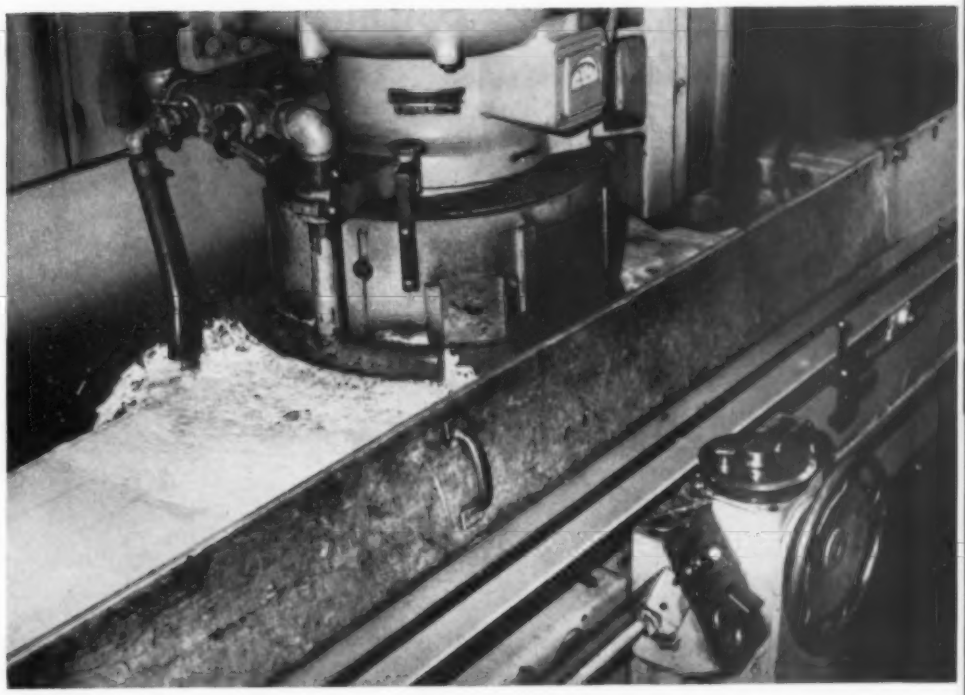
Design for Grinding

RICHARD L. McKEE • Managing Editor

Spending enough on grinding?



Increased power, rigid framing remove more stock in surface grinding.

● "Sorry. I probably don't have a case for you. You see, we grind all our stock either on surface or centerless grinders . . . "

This comment from the plant superintendent of a company producing flat stock and drill rod was a stopper. For them, the choice between grinding and single-point machining was strictly no contest.

It wasn't just because they "had grinding machines." Several major machines were obviously new; none of them appeared to be old. And all of them were very well maintained, recently painted, in good shape.

Over the past few years the company has maintained a very satisfactory level of profits and operations. Their work force has remained stable. All together, a profitable, well-managed operation.

It would be foolish, of course, to conclude that this favorable situation is caused only by their use of abrasive machining as a process. There are other obvious reasons. But it would be equally foolish to ignore the advantages of grinding in such a situation, where many of their competitors are using milling or planing for surfacing.

Such a conversation offered an opportunity to review the basic premise on which this column was founded two years ago: that abrasive machining in some form or other can be profitably used in more than its present applications, and that one way to promote its use is to report cases where this has happened.

The cases have not always involved design changes. They have, however, shown substantial savings based on company figures.

The four basic objectives of all metal-cutting operations, and their relationship to grinding, are stated below. They are the basis for the establishment and continuance of this column.

Dimensional accuracy
Precise surface finish
Generation of forms
Stock removal.

As to the first two, the position of grinding is established. Where either is of prime importance, some form of abrasive machining is used.

Take accuracy for instance. The wear on an abrasive wheel is distributed among thousands of points, instead of being concentrated on one, as it is in single-point machining. Further, with many wheels self-dressing, or with continuous or cyclical dressing practicable in many installations, and with infinitely variable downfeed or infeed, the abrasive wheel can maintain needle-point accuracy, piece after piece, on long production runs.

Variable pressures in grinding make possible the grinding of thin parts where distortion could be a problem, and quite frequently allow for roughing and finishing in the same set-up, without any material-handling time or allowances for tearing down and setting up again.

continued

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SURFACE GRINDER
with
NEW... EXCLUSIVE
AUTOMATIC FORCED LUBRICATION

- Continuous flow, recirculating system
- Washes away damaging grinding dust
- Triples life of ways
- Preserves original accuracy
- Promotes easy table operation
- Reduces maintenance—*oils complete machine*

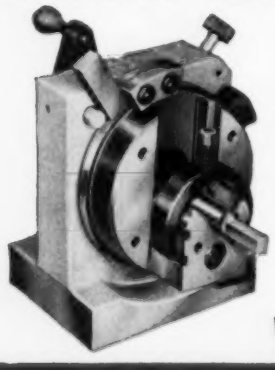
...and many other features included as standard equipment, all at a surprisingly low price!

DIRECT DRIVE SPINDLE AND OIL PUMP

WRITE FOR HARIG 612 BROCHURE

THE FASTEST WAY TO GRIND PERFORATORS . . . INCREASE ACCURACY

HARIG GRIND-ALL FIXTURE



Easily grinds irregular shaped perforators concentric with shank within ± .0001 accuracy. Also can be used for milling, boring, and inspection. New features include V-block adjusting screw and sine arrangement to obtain any desired angle. Attachment available to convert Grind-all into precision Radius Dresser.

WRITE FOR NEW GRIND-ALL BROCHURE

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DESIGN FOR GRINDING

continued

Or take surface finish. Some abrasive operations can achieve any desired microinch finish, and so economically that there is a tendency in many plants to specify extreme finishes when they are not necessary and when they may even be detrimental.

Or consider the generation of forms. With a wide variety of diamond and crush forming attachments available, the possibilities are almost endless.

A recent visitor brought in a stainless steel razor blade into which a series of perhaps a dozen slots .004" wide and .004" apart had been cut with a vitrified aluminum oxide wheel of approximately 320 grit.

It was just a stunt, perhaps, but yesterday's stunt becomes today's production routine. Even with all that has been done, the possibilities of grinding for grooving, slotting, and the generation of other forms has hardly been touched.

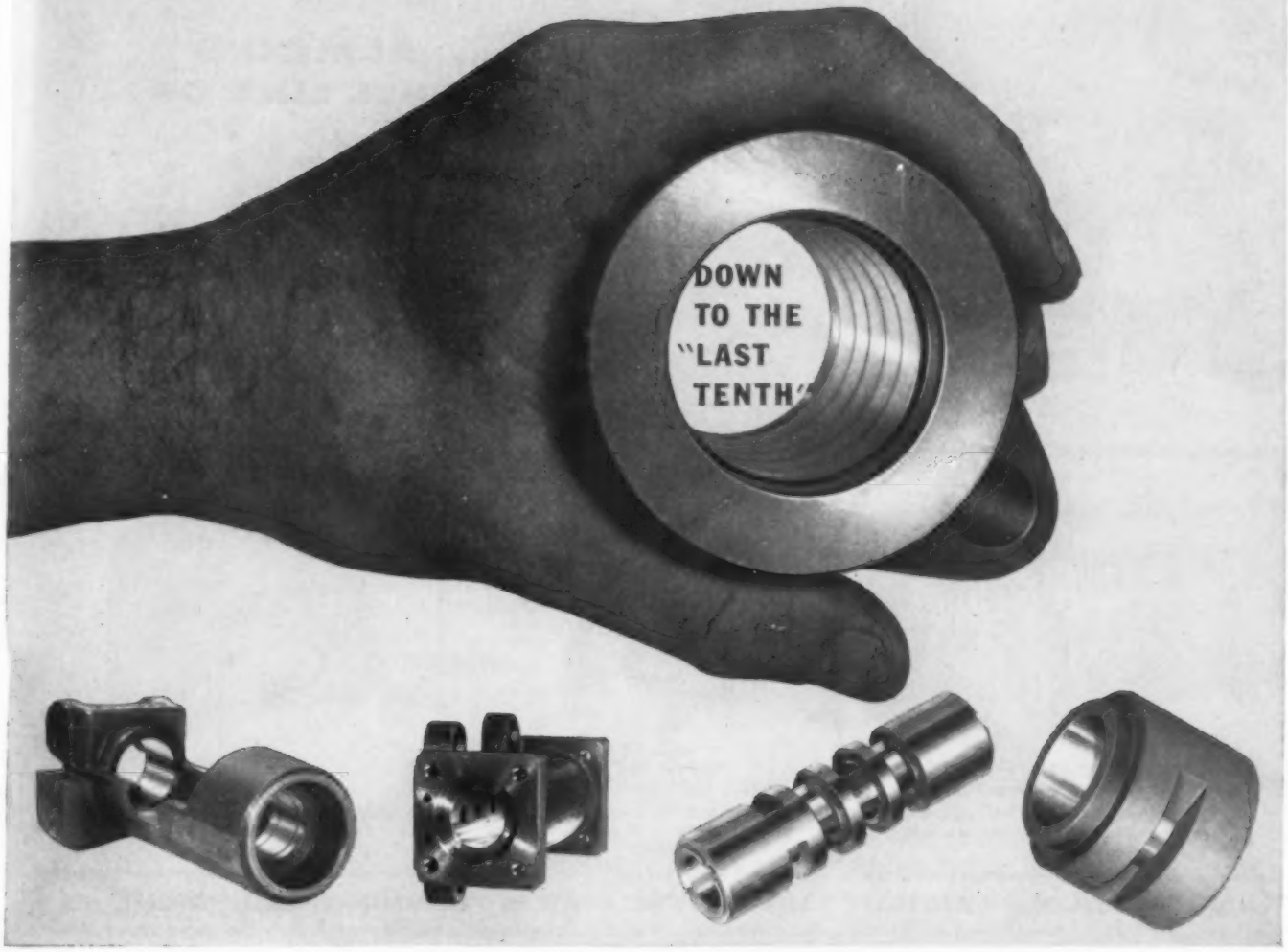
It is in stock removal that grinding should come into its own. Proponents of grinding talk of profitable stock removal up to one-half inch. There may be something of a "chicken-and-egg" situation about grinding wheels and machines. But wheel makers have made extremely hard wheels for machine snagging and for ball bearing grinding, and machine builders have made machines to take greater pressures than are in discussion now. Both of the major requirements are taken care of; the problem is to bring them together.

Neither surface interruptions nor hard spots in the metal are barriers to grinding. An interrupted surface is an advantage, in fact, because it means finishing only those areas which are essential, reducing both labor and material costs.

Add such factors as the ease of setting up—"Select your fixtures from the scrap pile," as one recent ad puts it—and the reduction in handling costs which can result from roughing and finishing with the same set-up, and grinding assumes new stature.

Future issues will continue specific instances of profitable substitution of abrasive machining for some other form of metalworking. Look for them. You may find it profitable, as my friend did, to spend on abrasive machining. • • •

FAST STOCK REMOVAL + PRECISION



Many shops still think of Honing only as a finishing operation for ultra-precision I. D. work. However, **Sunnen Honing** is also rapidly gaining recognition as a fast abrasive stock removal process.

In many cases, Sunnen Honing has actually eliminated costly double-reaming, bore and ream, finish boring and internal grinding operations.

Coarse grit stones remove considerable stock . . . fine grit stones produce final I. D. tolerance and finish.

Sunnen Honing DOES produce ANY degree of precision required: Geometric accuracy is an inherent advantage of this honing process. Design of Sunnen Honing tools guarantees tolerances to .0001", and straight round holes with any desired finish.

Average machine cost with tooling: $1,000.

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SUNNEN HONING

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ASK FOR FREE BOOKLET

. . . with data on 99 case histories covering all types of I. D. problems.

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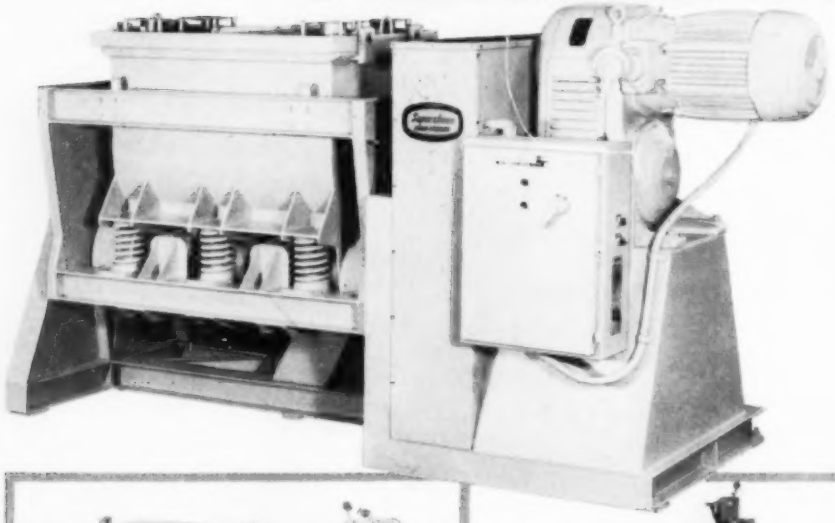
UP TO 100 TIMES FASTER FINISHING WITH

ALMCO

VIBRASHEEN



ALMCO'S FULL LINE OF NEW VIBRASHEEN MACHINES

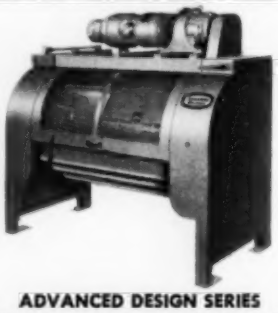
MODELS VT-717 — 712
(18 and 12 cu. ft. capacities)
Ideal for large components requiring fixtures or a large volume of smaller parts.

MODELS VT-77 — 75
(7 and 5 cu. ft. capacities)
Efficiently deburrs and finishes parts in quantities suitable for medium size production runs.

MODELS VT-72 — 71
(2½ and 1 cu. ft. capacities)
Popular unit for firms requiring precise finishing of a wide variety of parts in small lots.

MODEL VT-70
(3 Qt. capacity)
Bench model ideally suited for miniature bearings, extremely small gears, stampings, etc.

WORLD'S LARGEST LINE OF PRECISION FINISHING EQUIPMENT

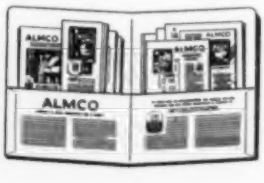


ADVANCED DESIGN SERIES
Thirteen models are available in this series featuring capacities of from 5 to 40 cu. ft., each equipped with variable speed drives. (Infinite from 6 to 30 rpm's.)

SPINDLE MACHINES
Designed for fast precision finishing of complex, high quality components such as gears, bearing cages, spline shafts, rotors, on continuous production "in line" basis.

CUSTOM DESIGN BARRELS
Special large diameter barrels are available to accommodate extra large parts. Fixtures hold parts to assure complete, precise finishing of all crevices and surfaces.

SEND FOR NEW ALMCO CATALOGS ON BARREL FINISHING MACHINES MEDIA, AND COMPOUNDS



ALMCO
Supersheen

Queen Products Division Of King-Seeley Thermos Co.
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Metalworking on the move

The seventh United States Trade Mission to visit Japan left Washington after a week of con- sultations with the U.S. Department of Commerce, the Japanese Ambassador and his staff, and the Department of State. In his talk with Trade Mission members prior to their departure, Assistant Secretary of Commerce for International Affairs Rowland Burnstan emphasized the importance of further expanding the already significant commercial relations between Japan and the United States. He stressed that easing Japan's import controls would permit entry of more American goods to assist in further improvement of Japanese economy and, at the same time, benefit the economy of this nation.

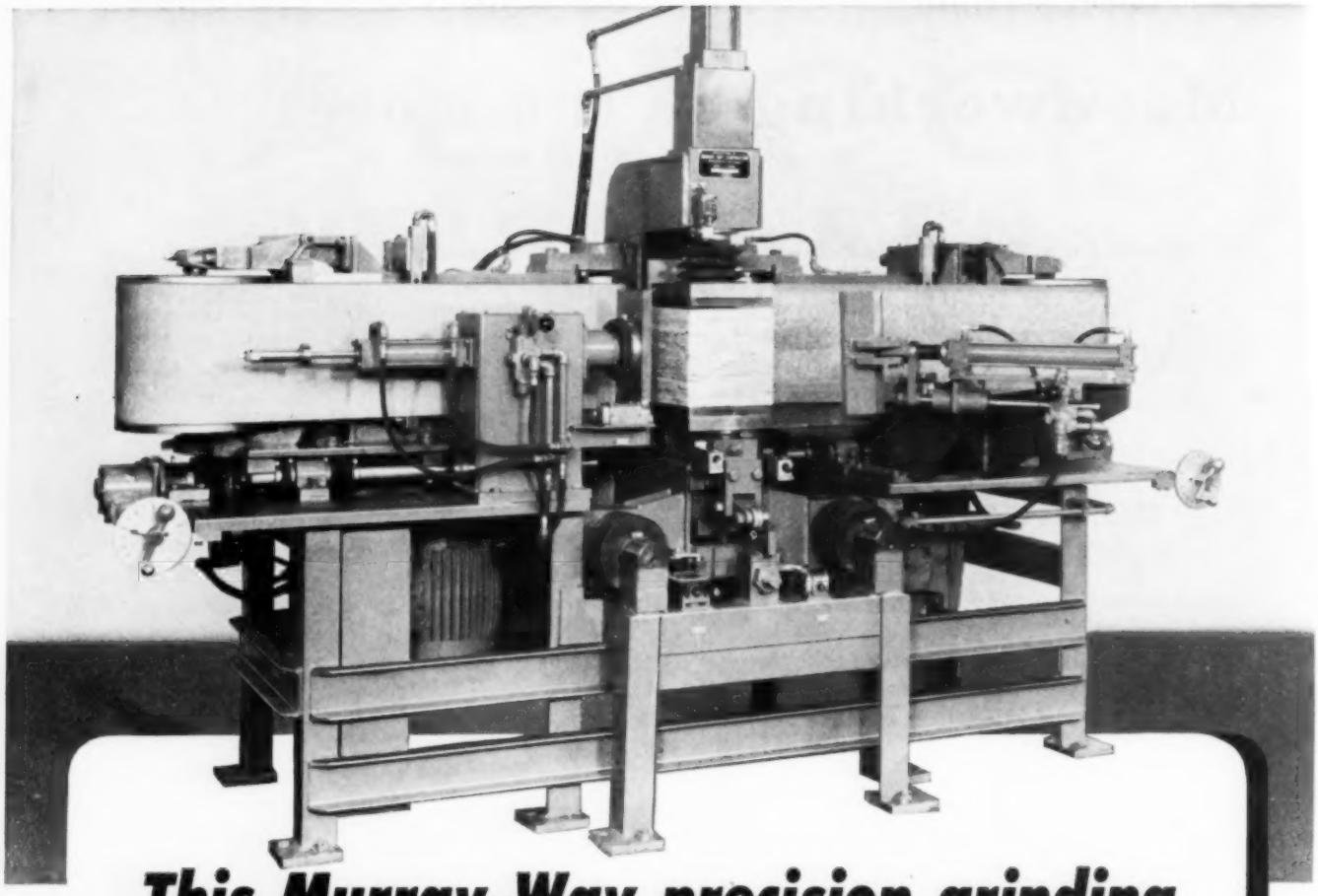
Latrobe Steel Company, Latrobe, Pa., has informed its stockholders of an expansion program of "something over $1.3 million" for 1961. The expansion will include a new 30-inch vacuum consumable electrode furnace, the installation of a new 3,250-ton forging press, a new 9-inch finishing mill and auxiliary equipment. Completion of the program is expected in late 1961 or early 1962.

Construction of a new $2.5 million plant for the Reed Instrument Bearing Co., a division of SKF Industries Inc., is underway in Los Angeles, Calif. Scheduled for completion August, 1961, the new single story facility is located on a 10-acre tract and will contain some 35,000 square feet of office and production space. A special feature of the building will be a "White Room" which will embody the latest known White Room features along with several techniques developed by SKF production engineers.

A total of 466 apprentices and trainees from 171 individual companies competed in the 1961 Robert E. Kennedy Memorial Apprentice Contest, sponsored annually by the American Foundrymen's Society. Top divisional winners were: Wood Pattern-making Division—Kenneth E. McGarr, Poppenger & Howell Co., Arkon, Ohio; Metal Pattern Division—James S. Arnold, Progress Pattern Co., Detroit, Mich.; Iron Molding Division—William Mulvey, Brown & Sharpe Mfg. Co., Providence, R.I.; Steel Molding Division—Donald A. Sprague, Columbia Steel Casting Co., Portland, Ore.; Non-Ferrous Molding Division—Wayne Belanger, Bird Aluminum Foundry, Ltd., Vancouver, B.C.

The Rotor Tool Co., Cleveland, Ohio, manufacturer of portable air and high cycle tools, has announced formation of the Rotor Tool Company of Canada, Limited. The new firm is a wholly-owned subsidiary of the Rotor Tool Co. and an affiliate of Cooper-Bessemer Corp. of Canada, Ltd. The new firm has been organized for the manufacture, sale, and service of Rotor Tool products in Canada.

Commercial production of mill products of columbium metal and columbium alloys at Du Pont's new metals center has been announced by Colin I. Bradford, director of metals products for the company's Pigments Department. The new installation will produce columbium and columbium alloy sheets, strips, plates, bars, tubes, and other shapes used by metal fabricators. The facility is designed so that tantalum, tungsten, and molybdenum can be produced in the future. The price for columbium mill products averages approximately $60 a pound.



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How do you buy?

Do you buy objectively? Can you honestly state that the purchases you have recommended have been completely objective?

We all realize that there are many things which influence the recommendation of a specific manufacturer. The solution to objective buying is to evaluate each product for every factor which affects the ultimate value of the product to your application.

This sounds like a lot of work, but the rewards are well worth the effort. And, the effort once applied, is often much less than it appears to be.

To be more specific we have found many recommendations are made on incomplete information. The establishment of what information is needed thus becomes the first order of business. Take a little time right now and list all the factors influencing the purchase of—say machines or wheels. To this list add anything which comes to mind in the next two or three weeks and also question salesmen on what they would consider important factors to consider. Be sure and have too many. You will be better off having too much than too little.

When you feel you have all the factors that in any way will affect the purchase draw up a chart. This chart thus becomes a factual evaluation of all competitors for your purchase. With charts such as these you can objectively face any objection to your selection. They will also make the selection of suppliers for you.

Once you have established charts on all general classifications of products you recommend, your work load will be less. Granted, initially there is work connected with the development of the charts.

One of the lines should be devoted to the present method or product. With this as the basis for economic evaluation of competitors, you can establish a savings per part or what ever economic comparison called for.

Don't miss the intangibles. The chart should include service, dependability, etc. While these factors can't be established in cold figures they can be given a relative importance and a comparative analysis of competitors made on the basis of your past experience or their reputation. These are factors which must be included in any objective evaluation even if they are less objective than other factors. They will and do affect the economic value of the product.

One of the statements we have heard repeated by outside observers of metalworking manufacturing is, "There seems to be a certain amount of fear connected with purchasing." This is a nasty reputation. It implies that management is afraid of the stockholders; production and engineering is afraid of management, etc. I would prefer to feel that we do not have confidence due to a lack of objective buying habits. If we have objectively weighed all the factors we can stand on our recommendation because it is as correct as possible. It is within your power to be confident.

M. M. Patterson

Editor, Grinding and Finishing

Rectangular orifices being cavitated on a Sheffield. Note the elaborate locating and holding fixtures being used. Instrument at the extreme right is used to calibrate the orifice spacing, which is critical.

ABRASIVE MACHINING in the Space Age

By B. R. McDONNELL, Sr., honing engineer
Sunnen Products Company

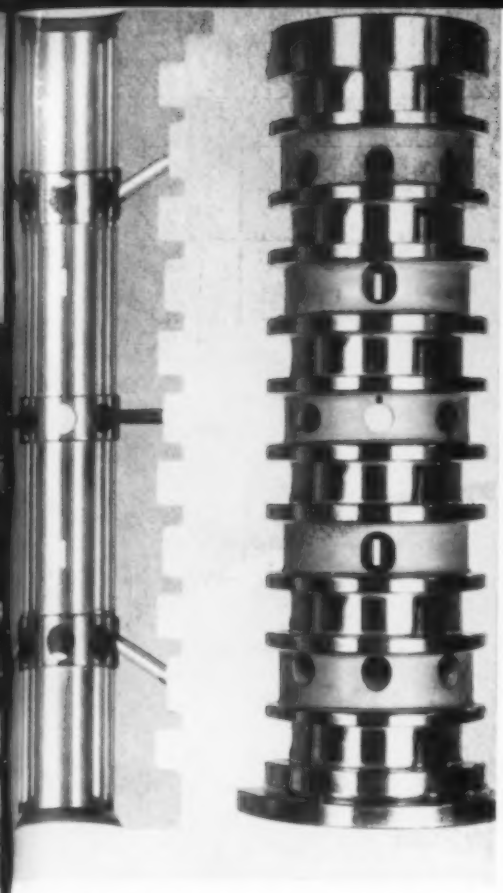
"For want of a nail . . ." Components for missiles and other space-age vehicles MUST be right. Their specifications include step-by-step production methods plus tolerances in millionths which only abrasives can produce. One small component illustrates the care that must be taken—and the variety of grinding and finishing processes involved.

● Space-age requirements for tolerances approaching the vanishing point, and the part that abrasive machining plays in attaining them become extremely dramatic when demonstrated in terms of one isolated item.

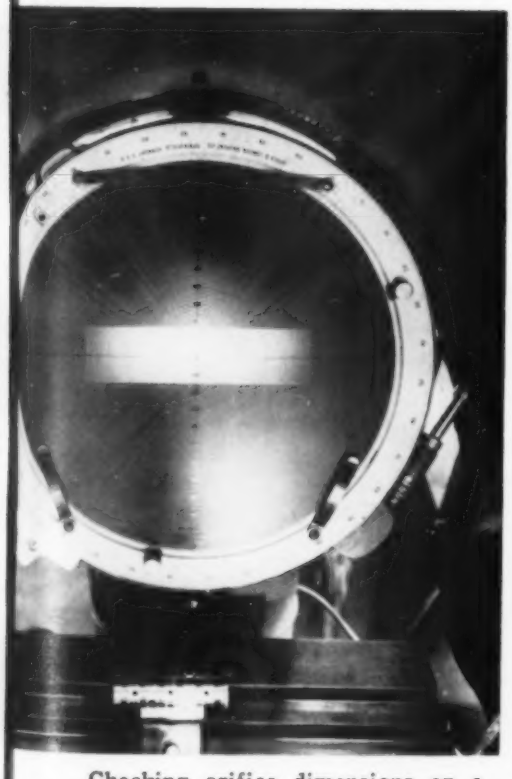
The plight of an entire nation can be expressed in a photo of one starving waif.

The fantastic requirements of the space age can be summed up in the manufacturing sequence of one small component.

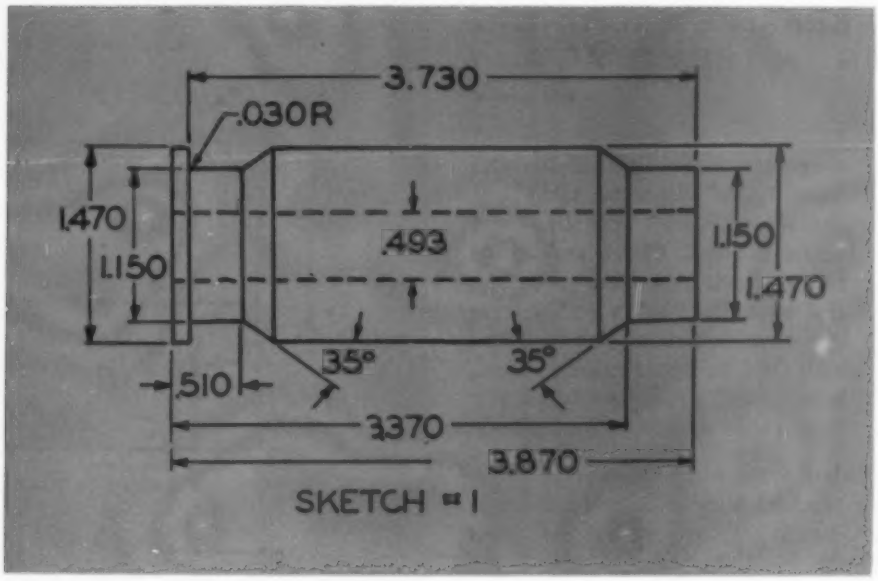
The component selected is a hydraulic sleeve and slider unit for a missile servo-control unit. It is manufactured by Sargent Brothers, Tulsa, Oklahoma, a specialist in the field of missile controls and their component



Cut-open sleeve sample, finished sleeve. Note ID, hone finished bore and polished OD O-ring grooves. Inside and outside views.



Checking orifice dimensions on a J & L comparator at 62½ X. Actual dimensions; 0.30" x .125" with corner radii within .001".



SKETCH #1

parts, for Chance-Vought Aircraft Company, Dallas, Texas.

Now an "earthbound" hydraulic control is a standard stock item. If it is made of cast iron, it is bored, broached, and honed. If of steel, it requires deburring, heat treating, stress relief, and rough and finish honing. Such a unit can be turned out by the millions, routinely.

Such a part destined for outer space is quite another matter. It represents the utmost in product integrity. It must be accurate to millionths. Its specifications include not only tolerances, but also the specific processes for attaining them.

Note the emphasis laid upon abrasives in the following abbreviated procedure. All of the finishing and most of the roughing operations are done with abrasives in one form or another.

Even in summary the procedure is not simple. Note also the great care that is taken to make sure that not the slightest trace of induced stress is retained in the work part. Even the minutest stress could prove fatal in the missile's operating environment.

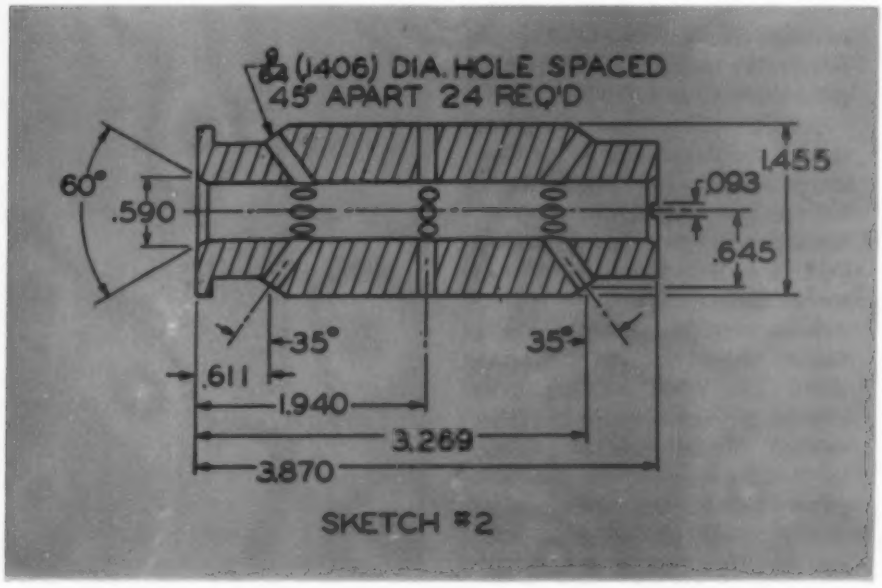
First Roughing Operation

Saw round, annealed 1½" dia. 52100 steel bar stock to lengths of 3.980". Centerless grind to diameter of 1.470" + .001" — .000". Lathe face both ends. Gun drill axis. Chuck first one end, then the other, and machine to form specifications as shown in Sketch No. 1.

Second Roughing Operation

Hone gun-drilled bore on a Sunnen honing machine for a push fit by

continued



SKETCH #2

ABRASIVE MACHINING IN THE SPACE AGE

continued

a centered arbor. Grind the OD from 1.470″ down to 1.455″ + .0000″ — .0005″. Mill .093″ slot across one end. Chuck and steady rest first one end, then the other, and establish .590″ x 60° centers in both ends, holding .0005″ T.I.R. with OD. Drill and ream 24 cross holes .1406″ diameter (Sketch No. 2). Re-hone central bore to deburr.

Third Roughing Operation

Machine body on lathe as shown in sketch No. 3. Crush form grind the head diameter to .1420, the body diameter to 1.140″, and the five OD fluid grooves (Sketch No. 4). End mill the four blind, oval, flat-bottomed counterbores.

Heat Treating

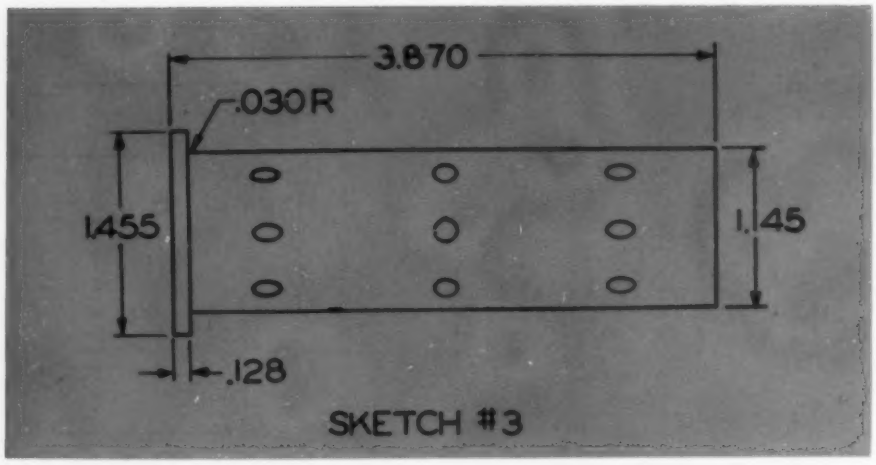
Copper-plate the sleeve to prevent decarburizing. Put through heat treatment and multiple stress relief operations. Strip copper plate and bake sleeve at specified low temperature in suitable atmosphere for more than eight hours.

Parts come out bright, 60-65 Rc, and perfectly stress free. The aircraft manufacturer at this point runs an analysis on a sample from the heat treat batch. The precision finishing process begins after the samples are approved.

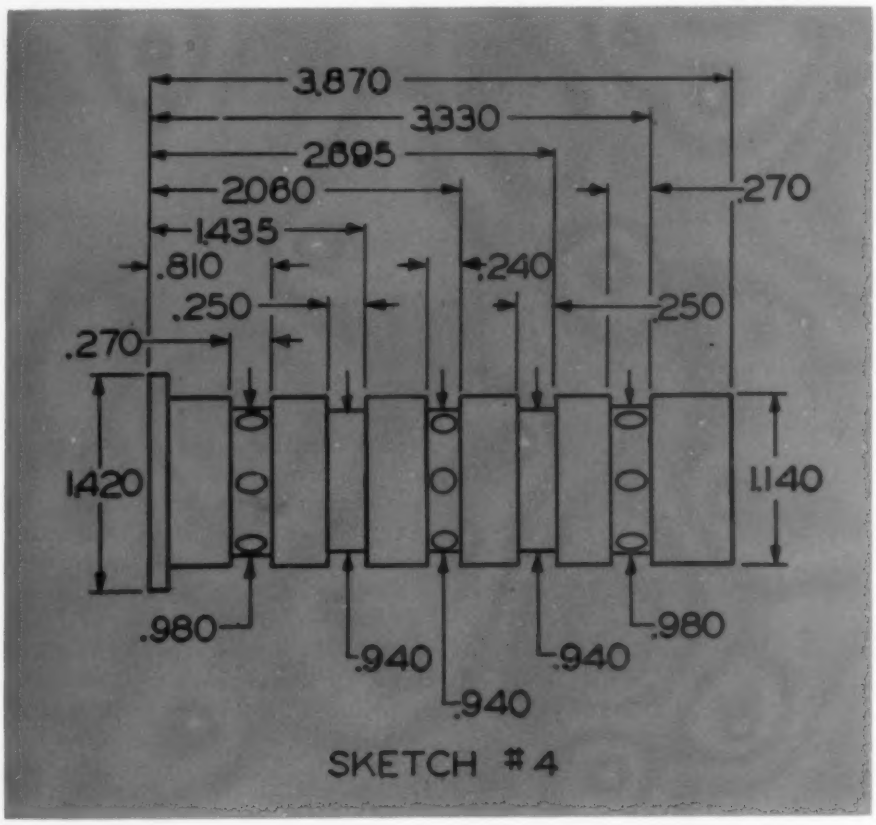
First Finishing Operation

Rehone the bore (third ID honing) for a push fit on a centered arbor, using a long hardened steel mandrel to assure axial straightness. Grind the OD between centers to establish concentricity, holding the flange OD to 1.3992″. Centerless grind the body to 1.133″ + .0000″ — .0005″ OD. Grind the inside face of the flange wall to establish length to the other end of work, holding this length within .001″. Surface grind both ends, holding total length within .0005″ of specifications.

Rehone bore (fourth honing) on a Sunnen hone to .495″, holding .0005″ — .0000″. Grind three internal grooves covering the cross drillings (Bryant internal grinder) to .540″ diameters, the two end grooves .250″ wide, the center .200″ wide, all corners .020″ radius. Grind bore to .4985″, half-



SKETCH #3



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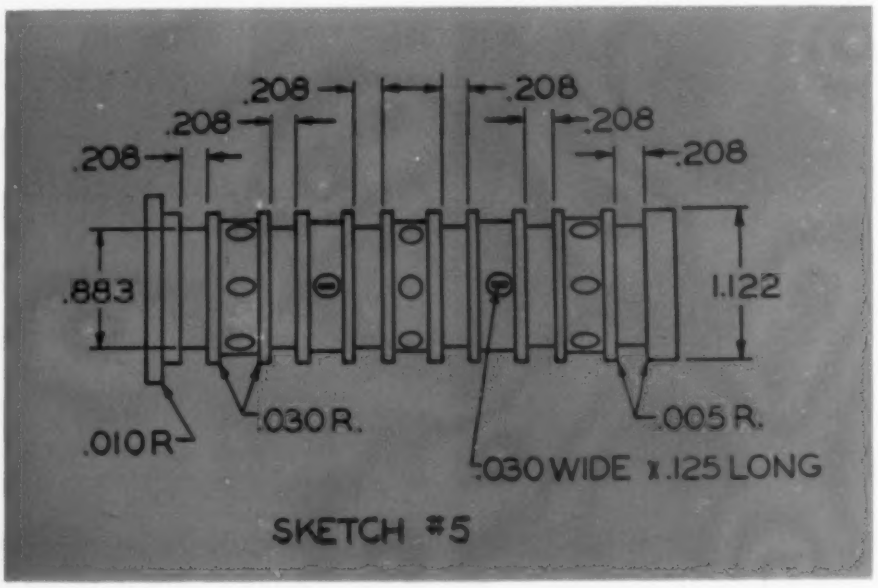
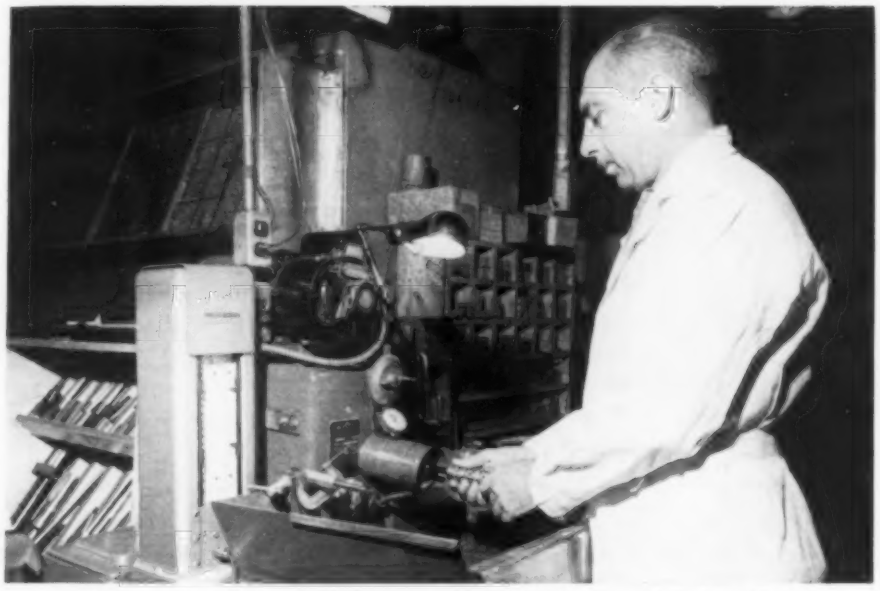
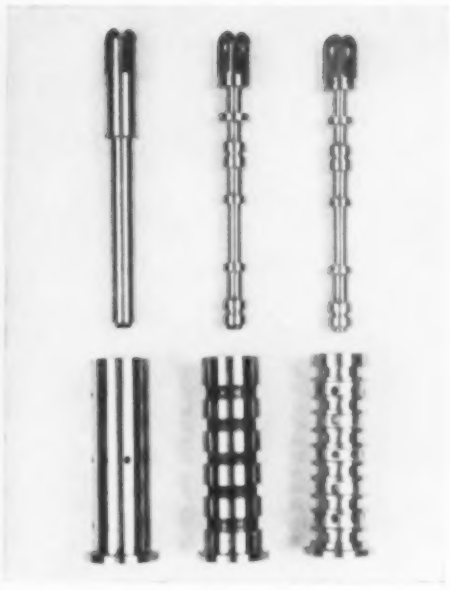


SKETCH #5



Sleeve bore being honed on Sunnen honing machine. Each is honed five times on this machine. Honed surfaces are stress-free.



Sleeve and slider samples: three stages in forming by crush grinding.

Sleeve-and-slider assembly tested for leakage, hydraulic balance.

way from one side, halfway from the other, on Bryant internal grinder to establish concentricity with the three grooves. Centerless grind six O-ring grooves on body OD (Sketch No. 5), .208″ ± .005″ wide by .883″ + .000″ — .002″. Bake part to relieve stresses. Centerless grind top of lands to 1.122″ + .0000″ — .0004″, holding round within .0002″. Grind .030″ radius on corners of fluid groove lands.

Final Finish

Polish six O-ring grooves. Radius corners of their lands .005″ and corners of flange .010″. Cadmium plate both end surfaces. Chrome plate all OD surfaces. . . (No plating on any ID surface.) Bake part 8 hours at specified low temperature for complete stress relief. Grind plated flange and land tops back to finish size so part will fit exactly in Sheffield Cavitron® fixture. Form four rectangular orifices on Cavitron .030″ + .001″ — .000″ by .125″ + .001″ — .000″ holding all corners to radius less than .001″. Inspect cavitated orifices on J & L comparator. Hone bore (fifth honing) to .4995″, holding bore straight and round within fifteen millionths of an inch.

During these operations the sleeve is magnafluxed eleven times, put through numerous ultrasonic and solvent cleanings, and has passed ten formal inspections.

Machining the Slider

The slider is made by a series of operations very similar to the processing of the sleeve. This involves a combination of center, centerless, and crush form grinding before and after heat treatment to 63 Rc.

Between each pair of grinding operations the part is stress relieved, magnafluxed, and inspected. The three extremely narrow grooves (one atop each middle land and one on the hub of the clevis head) are established on a thread grinder, all others by crush grinding with a wide formed wheel.

The land tops are finish lapped with a ring lap of sufficient length to cover three lands at the same time, to maintain absolute concentricity. The clevis pin holes are tandem honed to size.

Final Assembly Testing

After both parts are lapped for mating, the assembly is put through an exhaustive test on an elaborate Sprague test stand, checking for leakage, operating balance, and performance. The spacing of the cavitated orifices in the sleeve and the two center lands on the slider must be exact so as to match for operating balance.

The mated units are packed in sealed glass tubes before they are packaged for shipment. • • •

Standard Marking System

C 36 L 5 V

What you should know about
BOND TYPES

Vitrified	V	Rubber	R
Resinoid	B	Rubber Reinforced	RF
Resinoid Reinforced	BF	Silicate	S
Shellac	E	Oxychloride	O

By RICHARD L. McKEE, Managing Editor

● Bond is perhaps the most important single factor in the standard marking system, if one could be so singled out.

Broadly speaking, the bond determines the maximum safe speed of a wheel. It limits the applications of the wheel. Vitrified wheels are more amenable to crush forming than resinoid or rubber; on the other hand, their maximum safe speed is much lower than that of the two organic bonds, other factors being equal.

Certain types of applications have been virtually limited to certain bonds, as resinoid for snagging, vitrified for precision and toolroom grinding, rubber for regulating wheels in centerless grinding, and rubber or resinoid for cut-off wheels. At least two of the six bonds included in the standard system survive because of their performance in certain specialized situations.

The bond has influences on the coolant used. Rubber wheels do not take kindly to oil-based fluids, nor resinoid to alkaline solutions. And of course, the basic manufacturing process is governed by the bond employed.

Bond symbol

Bond is indicated by the fifth symbol of the marking, immediately after the structure number. The code is easily recognized: V for vitrified (glass or clay); B for resinoid (originating from bakelite, the first such bond used); R for rubber (it was used earlier than resinoid, and established a priority); E for shellac (originally the "elastic" bond); S for silicate (of soda); and O for oxychloride (of magnesium). Two others, BF for resinoid reinforced, and RF for rubber reinforced, are also recognized in **The Grinding Wheel**[1].

The sixth symbol

Discussions of the standard marking system often mention a sixth position, optional, reserved for any purpose a manufacturer might designate. There is such a position. Since it usually designates a variation of the bond, it is as properly considered as a part of the bond symbol.

There are many different types of vitrified and resinoid bonds whose composition is proprietary information of the manufacturer. And there is no way of telling what bond of manufacturer A corresponds to what bond of manufacturer B. The situation is similar with the other bonds, but perhaps less complicated only because the bonds are less widely used.

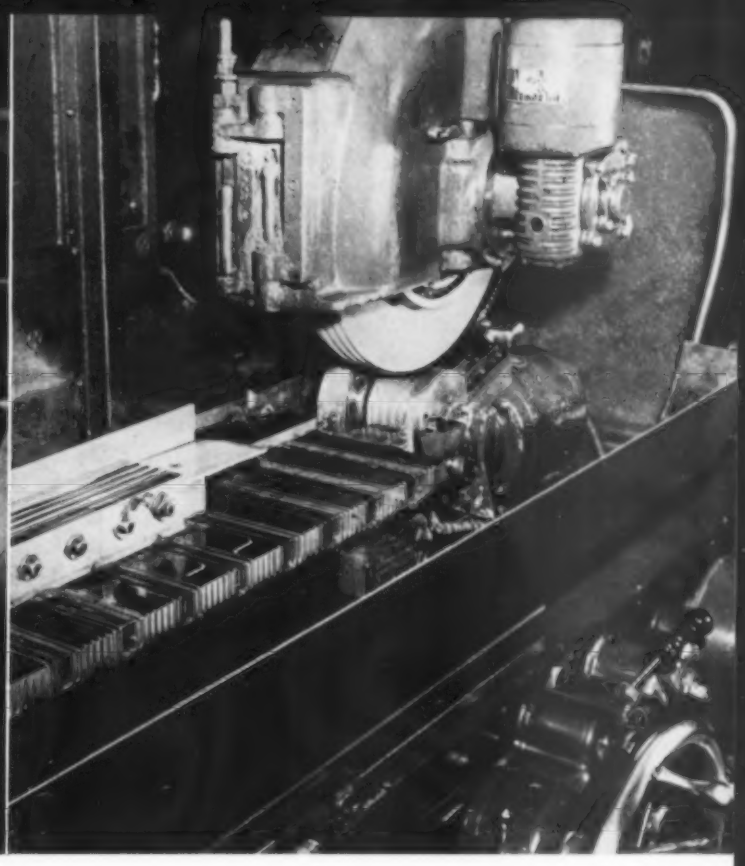
Some typical markings are:

A-36N5-**V**22
TA-163-P-**B**5

This is the last article of five on the standard marking system which have appeared monthly since February, 1961. The first four articles dealt with abrasive grain types, grain sizes, wheel grade, and wheel structure.

Reprints of the complete series will be available about July 1. Tear sheets of individual articles will be available as long as the supply lasts.

Vitrified bonded wheels on a surface grinder. In this instance the operator is wet grinding the chuck.



Vitrified bonds are well adapted to form grinding, either with diamond dressed or crush-dressed wheels (above).

A60-P-**R**27
A60-K4**E**

The "V" of the first marking indicates a vitrified wheel, this one a medium wheel for general machine shop grinding. The "B" of the second indicates a resinoid bond in a suggestion for weld snagging. In the third symbol, the "R" shows a rubber bond, in a cut-off wheel for wet grinding. The fourth, "E", is a shellac bonded wheel for toolroom use.

No abrasive effect

The bond at best has a negligible abrasive effect, if indeed it has any at all. Its sole function is to hold the abrasive grain together in a certain fashion which has been found through experience and research to be most suitable for the specific use.

Most vitrified bonds are clear, and do not affect the color of the wheel. Some, however, have a characteristic color which becomes a sort of trademark. However, as has been emphasized previously, wheel color results either from the natural hue of the ingredients or from added pigments with no abrasive effect whatever. In either case, the color as such does not affect wheel performance.

Vitrified bonds

Vitrified bonded wheels make up about half of all grinding wheels. This is the kind most often described in explanations of the manufacturing process. The bond is basically a clay or feldspar, which when fired at temperatures of approximately 2300° F is fused and becomes glassy. This, in fact, is the meaning of vitrification.

While this is not the oldest bond, historically speaking, it is probably the first to be used extensively in this country. It may be more than a coincidence that the first Norton Company wheels were fired in the little Worcester pottery which was the company's original area of operation.

Vitrified wheels are used in tool and cutter grinding; in most form grinding operations; for a host of cylindrical applications including crankshaft and camshaft grinding; for surface grinding; internal grinding; indeed, to some degree, for almost every type of grinding.

Vitrified wheels have many qualities that make them desirable. Because of their porosity and the strength of the bond, material removed per cubic inch of wheel wear is high. Vitrified bonded wheels are unusually inert, not affected by water, acids, oils, climatic nor the normal range of temperatures. Also, they are unusually uniform, i.e., free from hard or soft spots. They take kindly to form dressing, and in suitable grades and structures hold form well.

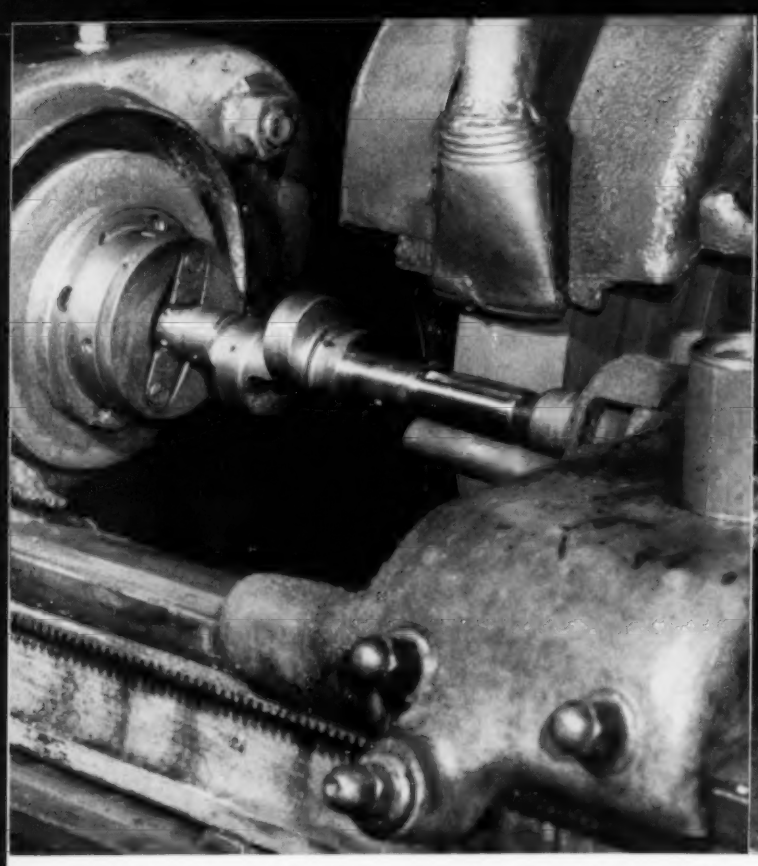
On the other hand, they are limited in operating speed. Though the 6500 sfpm safe maximum has been breached for a few special applications under rigidly controlled circumstances, it still remains as the nominal limit. Vitrified wheels, too, do not withstand the stresses of uses such as snagging as well as resinoid wheels.

Vitrified wheel making process

Most vitrified wheels are pressed, a process generally divided into the operations of mixing, molding, drying, firing, finishing and inspection.

Measured amounts of carefully prepared feldspars or clays (the bond) and abrasive grain are carefully weighed and thoroughly mixed in power mixers. Small amounts of other materials may be added to provide the finished product with desired characteristics. The mix is moistened with water or another temporary binder to

continued



Grinding a crankshaft is a common cylindrical grinding operation for which vitrified bond wheels are used.

Rough grinding with resinoid bonded cup wheels on portable grinders is another common application.

make the wheel stick together after it is pressed.

During molding, the mixture of bond and abrasive is uniformly distributed in a steel mold, and compressed in a powerful hydraulic press to form a wheel somewhat larger than its finished size. The amount of pressure varies with the structure desired.

In this "green" stage the wheels must be handled very carefully; they are fragile. After they are stripped from the molds, wheels are generally dried under carefully controlled temperature and humidity.

Vitrified wheels are molded straight. If the desired size is a non-standard diameter for which no mold is available, or if a recess or a relieved side is required, then this is usually "shaved" on a device resembling a potter's wheel. In some vitrified bonds this is not possible, and the recess or relief must be hogged out after the wheel is fired.

Firing is generally done either in a tunnel kiln or in a bell kiln, though some wheels are still "burned" in the old-style periodic kiln. The object is the same—to heat the wheel to a temperature sufficient to fuse and vitrify the bond, about 2300° F.

Once the firing is complete, only the size and the shape of the wheel can be changed. Its quality and cutting effectiveness are established.

In the finishing operations the wheels are trimmed to finish size and shape with hardened steel cutters, other abrasive wheels, or diamond cutters. The arbor holes are bushed to size with lead, babbitt, or other materials, or the hole may be simply reamed to correct size. Any metal insert—bushing or mandrel—must be inserted in the wheel after firing.

Other testing operations include balancing, speed testing for wheels over 6″ in diameter, grading, and marking, plus a final inspection to insure that the wheel is of the specified shape, size, and grain size, and that it is not chipped nor cracked.

Resinoid bond

Resinoid bonded wheels are used for high-speed, rough operations like snagging of billets and weldments, for cut-off wheels, for Types 6 and 11 cup wheels for portable grinding, for discs, and for roll grinding. They account for approximately a third of all wheels used.

Resinoid bonds can take higher speeds than any other; they are also probably the strongest. With a nominal maximum of 9,500 sfpm, they can go up to 16,000 sfpm, nearly three miles per minute, in well-guarded cut-off wheel installations. But while resinoid wheels can stand more rough treatment than most other grinding wheels, they should be checked out if they are dropped or bumped, to make sure they are in good condition before being re-used.

The weakness of the bond has been its liability to attack by coolants. Used wet, the wheels have worn out at a greater-than-normal rate. This has been improved by the use of coated grain, which resists coolants.

In the manufacture of these wheels, synthetic thermo-setting resin in powder or liquid form is mixed with abrasive grain and a plasticiser to make the mix moldable. After the wheel is hydraulically pressed to size in a mold similar to that used for vitrified wheels, it is baked at a temperature of 300-400° F for 12 hours to four days, depending on its size. During this process the mix softens first, then hardens with additional heat. Final hardness of the bond is retained after cooling. The rest of the process is similar to vitrified.

The classic resinoid application: a wheel running at about 9500 sfpm snagging scale from a bloom.

Rubber-bonded wheels are almost universally used as regulating wheels (right above) in centerless grinding.

The low baking temperature allows the insertion of bushings, reinforcing rings, and nuts to provide easier mounting of discs. Recesses can be molded in. The biggest difference of opinion is the "hot press-cold press" argument; both are feasible, but the relative merits of the resulting product are still a matter for discussion.

Rubber bond

Rubber bonded wheels have specific uses as wet cut-off wheels, where they provide nearly burr-free cuts; regulating wheels for centerless grinding; and for use on ball bearing races where a high finish is required. They constitute somewhat less than 10% of the total market.

The bond is pure rubber, either natural or synthetic. In the mixing operation, a specific amount of abrasive is rolled into the rubber until the mix is uniform. Sulphur is added as a vulcanizing agent. The sheet is passed through calender rolls to produce the required thickness. After mixing, the wheels are stamped out of the sheet and vulcanized in molds under pressure in ovens at about 300-350° F. Finishing and inspection are standard.

Shellac bond

Shellac bonded wheels are not suited for heavy-duty grinding. They are primarily used for producing high finishes on camshafts, rolls, and cutlery. The bond appears to provide a burnishing action. Shellac products are a minor part of the total market.

The making process for these wheels involves mixing abrasive grain and flake shellac in a steam-heated mixer which thoroughly coats the grain with bond. Wheels in the cut-off range, ⅛" thick and less are molded to exact size in heated steel molds. Thicker wheels are hot-pressed hydraulically in steel molds. After molding, the "green" wheels are set in quartz sand and baked a few hours at 300° F.

Silicate and oxychloride bonds

Neither silicate nor oxychloride bond commands a significant portion of the market. Both continue to exist on the basis of limited use—the first in cutlery grinding, and the second, as discs for grinding the ends of springs in a double spindle disc grinder. Both applications can probably be done as well by other bonds.

For silicate wheels, the mix of grain and bond is tamped to size. The grade of the wheel depends on the amount of tamping as well as the proportion between grain and bond. After drying, the wheels are baked.

For oxychloride bonded wheels, the grain and bond are mixed, the bond forming a cold-setting cement. After aging for a period ranging from a few days to a month, the wheel is ready.

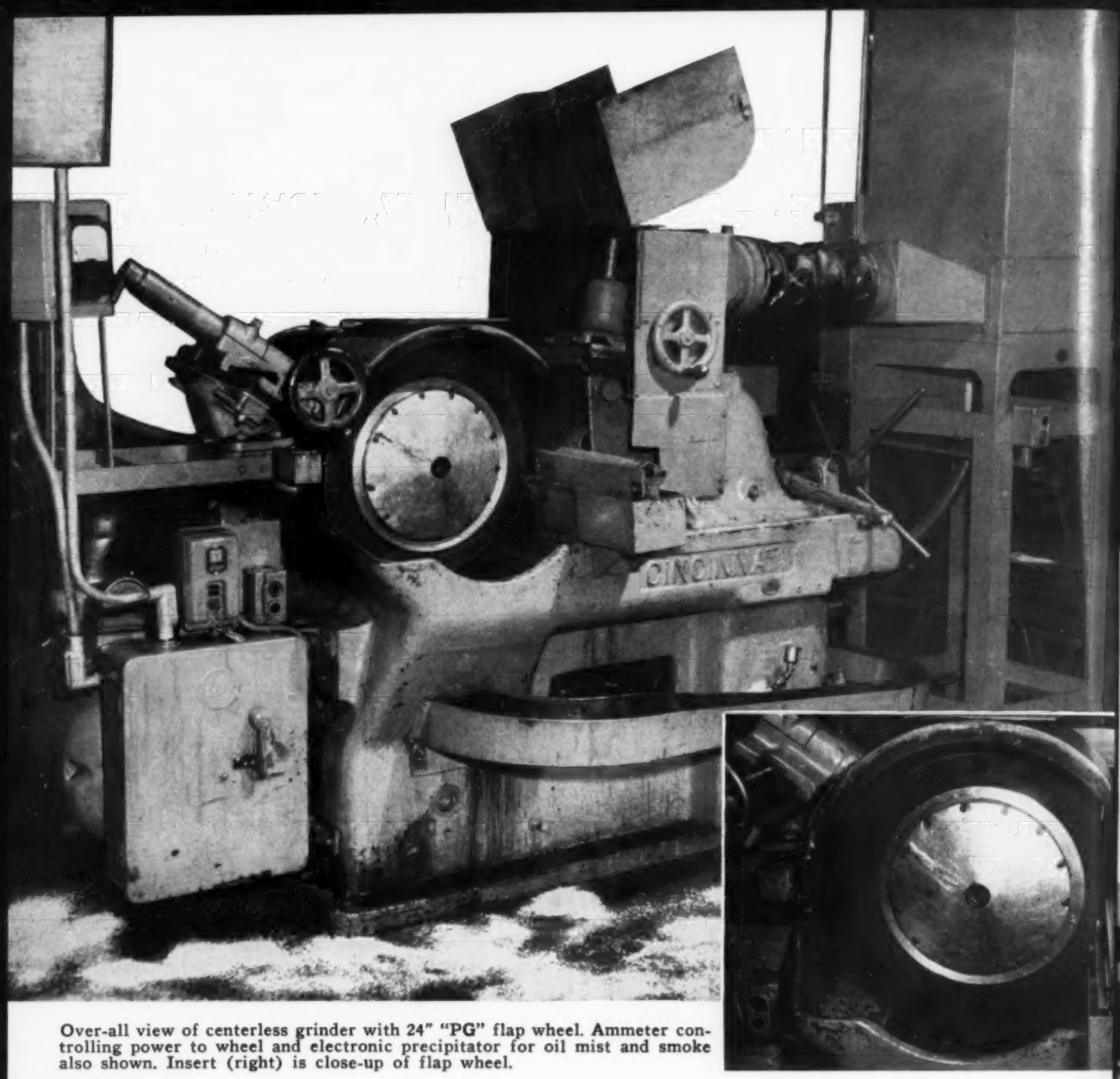
Conclusion

The standard wheel marking system has been developed as a code for identifying grinding wheels by their ingredients and characteristics. There are still many differences in wheels and their grinding action which cannot be expressed so simply. Differences in materials and in processing at present appear to be impossible to produce really standardized wheels.

This discussion has been designed primarily to help users to better understand wheel composition and performance, insofar as this is expressed in the marking. Expertness in abrasives and their uses is much too complex a skill to be picked up in five easy lessons. • • •

REFERENCE

1. Lewis, K. B. (Rev. Ed. by Schleicher, W. F.) *The Grinding Wheel*, Grinding Wheel Institute, Cleveland, Ohio, 1959. pp. 27-29.



Over-all view of centerless grinder with 24" "PG" flap wheel. Ammeter controlling power to wheel and electronic precipitator for oil mist and smoke also shown. Insert (right) is close-up of flap wheel.

Special to GRINDING and FINISHING

Flap wheel goes centerless

International Harvester's Indianapolis plant saved about $1,000 per month last year by installing a 24" special coated abrasive flap wheel on a "retread" centerless grinder.

Finish on each 150th rocker arm shaft is checked on the Profilometer® after shafts are cleaned and polished.

Wayne Poole, IH foreman holds shafts "before and after." A 25 rms specified; 17-20 is actual.

● A 24″ diameter coated abrasive "PG" flap wheel saved more than $1,000 a month last year in cleaning and finishing operation at the International Harvester Company Truck Engine plant in Indianapolis, Ind.

Making rocker arm shafts at the Indianapolis plant is just one of many steps in producing V-8 and 4 cylinder engines for IH trucks and for the "Scout" International's new all-purpose vehicle. But the flap wheel, installed on an obsolete hard wheel centerless grinder, saved IH $12,000 in 1960, based on what the unit processing cost would have been had the plant continued a hand method used previously on the operation.

The IH application was accomplished without a large capital investment. The centerless grinder that powers the flap wheel is a used machine and was bought at a fraction of the cost of a new abrasive belt grinder, according to Jules Caldwell, assistant mechanical engineer at the plant. A collector to filter and recirculate the honing base oil as a coolant also was installed.

Operating economy was an added benefit. Wayne Poole, department foreman, said 33,823 rocker arm shafts were finished with the first flap wheel. He expects 35,000 finished shafts with the second wheel.

Uniform quality, a problem in hand finishing, also has been achieved.

And because the wheel finishes shafts at a rate 100 times faster than did the fastest man on the hand finishing line, the grinder requires operation only 2½ to 3 hours a day.

The rocker arm shafts are 19¼″ long with a maximum OD of .865 and a minimum OD of .8625. The ID is .5″. They are made of 1010 butt-welded steel.

Eight ⅜″ diameter holes, one 11/32″ hole and eight ⅛″ holes are drilled into the shafts before the shafts are cleaned. The "PG" wheel chamfers the nine large holes which fit brackets to hold the shafts to the engine head. The ⅛″ oil holes, which need not be chamfered, are not affected by the wheel.

Because nine brackets hold each shaft in position on the small V-8 and 4-cylinder engines, the shaft need not be dead true. The carbo-nitride heat treating process, which penetrates the surface only .002 to .006″, distorts the shaft slightly and raises the finish 10 to 15 points on the rms scale. Final polishing with a conventional hard wheel centerless grinder was impractical since it would reduce the OD to the point where surface hardness would be removed. There lay the problem for Indianapolis Works.

Various grits were tried in the "hand method" of finishing, but it was difficult to maintain a uniform microfinish.

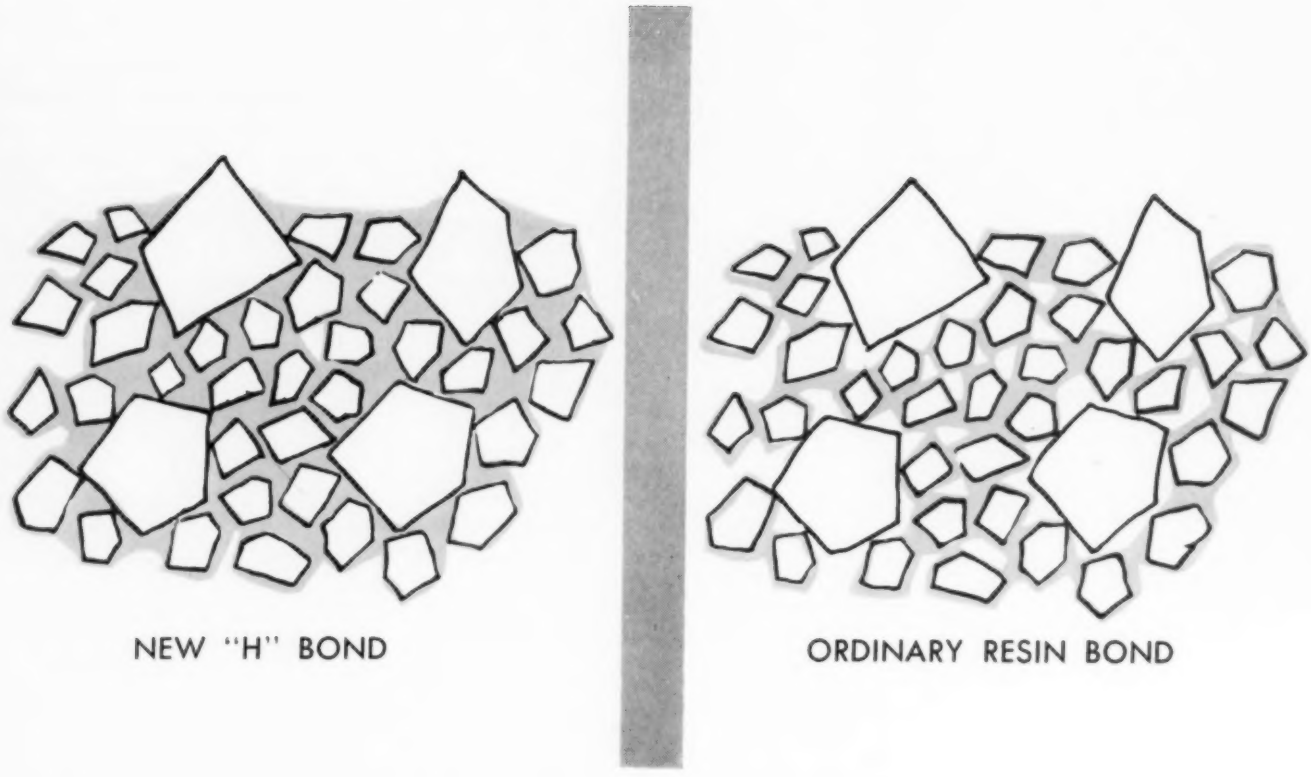
Constructing a "PG" wheel 6″ wide and 24″ in diameter to fit an available Cincinnati grinder was the solution proposed by Minnesota Mining and Manufacturing Co., and it has worked well. The wheel, not a stock size, has a 16″ aluminum hub. The hundreds of abrasive leaves that form the wheel are made with aluminum oxide grain, 280 grit, resin bonded to a cloth backing.

The wheel runs at 1285 rpm or 8081 sfm. The 12″ diameter hard rubber control wheel is run at 54 rpm.

The flexible wheel removes discoloration caused by surface hardening without undue stock removal. It produces 17 to 20 rms, although specifications require only 25 rms. When first installed, the wheel produced as low as 10 rms on the shafts, but backing off from the workpiece extended the life of the wheel and still produced 17 to 20 rms. The shafts go into the grinder at 40 to 45 rms.

An ammeter on the grinder shows the power being applied to the wheel. Infrequent adjustment keeps the wheel in proper position against the workpiece.

The wheel speed does not have to be changed as the hundreds of leaves that form the wheel become shorter. As the wheel wears, the leaves become firmer, keeping them in timed relationship with the work and retaining a constant rate of cut and a uniform finish. The wheel cannot become loaded because the abrasive surface in contact with the workpiece continually is worn away. • • •



New Resinoid Diamond Wheel Bond

Special to GRINDING and FINISHING

Molecular research provides new bond in which diamonds are chemically attached to the bond. The new bond's retention strength has greatly increased wheel life.

● It has always been difficult if not impossible to produce a bond that actually attaches itself to the diamond grit. Present bonds merely provide a mechanical holding or socket for the diamond. A new bond "BH" developed by Precision Diamond Tool Company, Elgin, Illinois, chemically bonds itself to the diamond particle.

Present bonds often release the diamond particles before their productive life is reached. Through intensive molecular research this new and entirely different method has been developed so that the diamonds are chemically attached to the bond. This new method has increased the grinding efficiency and decreased wheel wear.

The new bond which is being made available in all popular tool room sizes and shapes, has been thoroughly tested against the manufacturer's common resinoid bond. The results are as follows:

DRY GRINDING

Wheel: Type D11V9—3¾″ x 1½″ x 1¼″—MD150-N100 BH 1/16.

Test Procedure: Stock removal, infeed and crossfeed constant. Each test repeated five times.

Results:

Grinding Efficiency:

At .001″ per pass new bond 228% to old 100%.

At .002″ per pass new bond 210% to old 100%.

Wheel wear:

At .001″ per pass old bond .0016″, new bond .0007″. At .001″ per pass, old bond .004″, new bond .0019″.

WET GRINDING

Same wheel and test procedure.

Results:

Grinding Efficiency:

At .001″ per pass new bond 250% to old bond 100%. At .002″ per pass new bond 273% to old 100%.

Wheel wear:

At .001″ per pass, old bond .001″, new bond .0004″. At .002″ per pass, old bond .003″, new bond .0011″.

Field tests have been conducted and have substantiated the test results.

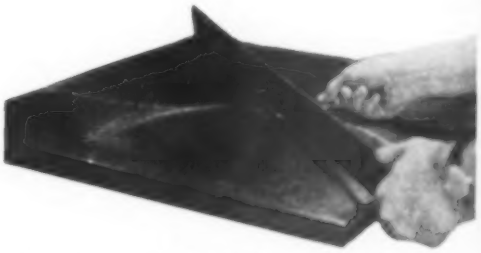
• • •

Jack Lewis, operator, is using a lifting magnet to put the plate onto grinder after the burning slag has been removed by hand grinding.

Operator's view while plate is being "step ground."

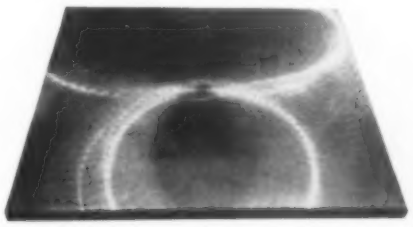
How grinding replaced planing

By WM. C. SIMCOX Simcox Grinding Co.



A precision straight edge and feeler gage are used to check plate warp.

The first operation on the plates used for rubber molds is the removal of scale and distortion amounting to 1/16″ per side. A good finish and parallelism is required. Surface grinding improved both requirements and reduced machining time from 3 hours to 55 minutes.



Finished plate of the Blanchard grinder, note criss-cross pattern and 32 rms finish.

● The rubber industry requires molds which are fabricated mostly from hot rolled carbon steel plate. The scale and distortion must be removed before the intricate shapes can be accurately machined into the plate. In the past, this clean-up operation was performed on a planer using a single-point tool. It took three hours to clean up to size both sides of an average 24″ x 24″ plate, removing 1/16″ on a side. The resulting finish tended to be rough and parallel relationship between the faces was no better than .008″. These factors made the operations following difficult and time consuming.

Now, the great majority of plates for the mold maker are ground on a powerful vertical spindle surface grinder with rotary magnet table. We grind both sides of a 34″ x 24″ plate in 55 minutes. Parallelism is held to .001″, flatness to .002″ corner to corner and surface finish is excellent. We use a segmental chuck for maximum efficiency. Exhaustive testing of wheel specifications has given us A-244- H 10 V as the best for plate grinding.

Replacement of planing by grinding has considerably cut fabrication costs of rubber molds. Not only has time been cut but quality has been improved. • • •

Ideas from the Shop

BLAST EQUIPMENT PROVIDES BY-PRODUCT BENEFIT

● Blast cleaning equipment purchased to solve specific finishing problems for Wesson Tool Company is providing an unexpected "bonus" benefit in an unrelated operation.

In one of their manufacturing sequences, a set-up of eight carbide tips is positioned for copper brazing to a common shank, with the tips held together by wires. After brazing in this form, the tips are cut apart.

The wires were formerly removed by hand, a costly operation. Now, sizeable batches of the set-ups are placed in a Pangborn Rotoblast® barrel. Shotblasting for a short period cuts through the wires, allowing them to fall off the easy way.

The carbon hold-down and spacing rods are also blasted apart by the hard-hitting abrasive stream. In addition, when the brazed parts are removed from the barrel, they are perfectly clean and ready for cutting into sections. • • •

R. E. Hunt, of Wesson Tool Company's manufacturing research department displays a set-up of eight carbide tips positioned for brazing to a common shank. Blasting has replaced handwork for removing wires.

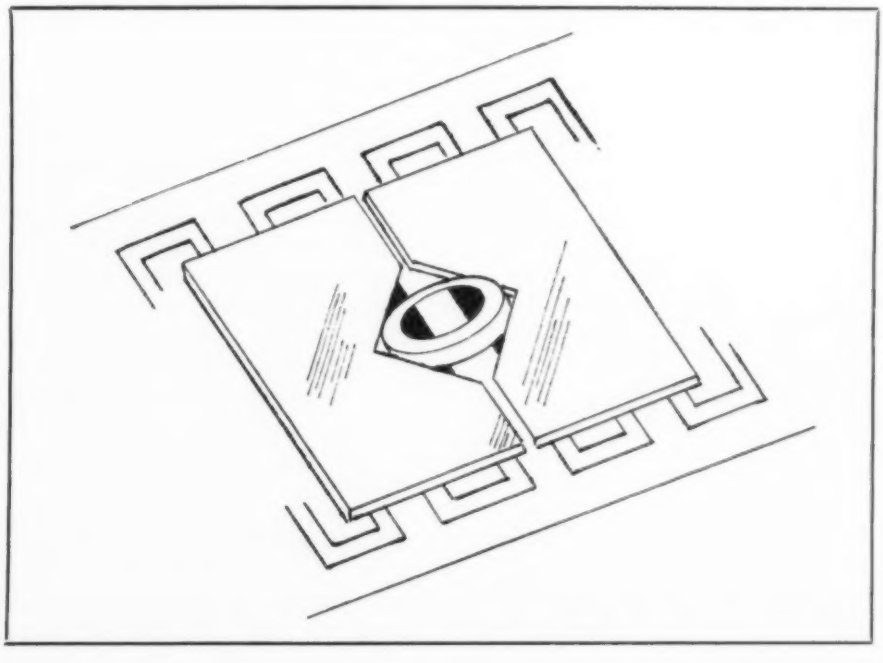
HOLDING THIN SECTIONS ON MAGNETIC CHUCK

By M. W. Loftus

• Holding narrow rings or washers on a magnetic chuck for grinding is often a problem. There is generally not enough metal to enable them to be held securely. Non-magnetic rings, of course, require blocking before they can be ground.

If two pieces of flat stock slightly thinner than the parts and with a vee ground in as illustrated are used, the parts will be securely held and will not slip during grinding.

Matching notched plates to hold several piece-parts can also be made, the size and the number of notches depending on the size of the parts and the size of the chuck.



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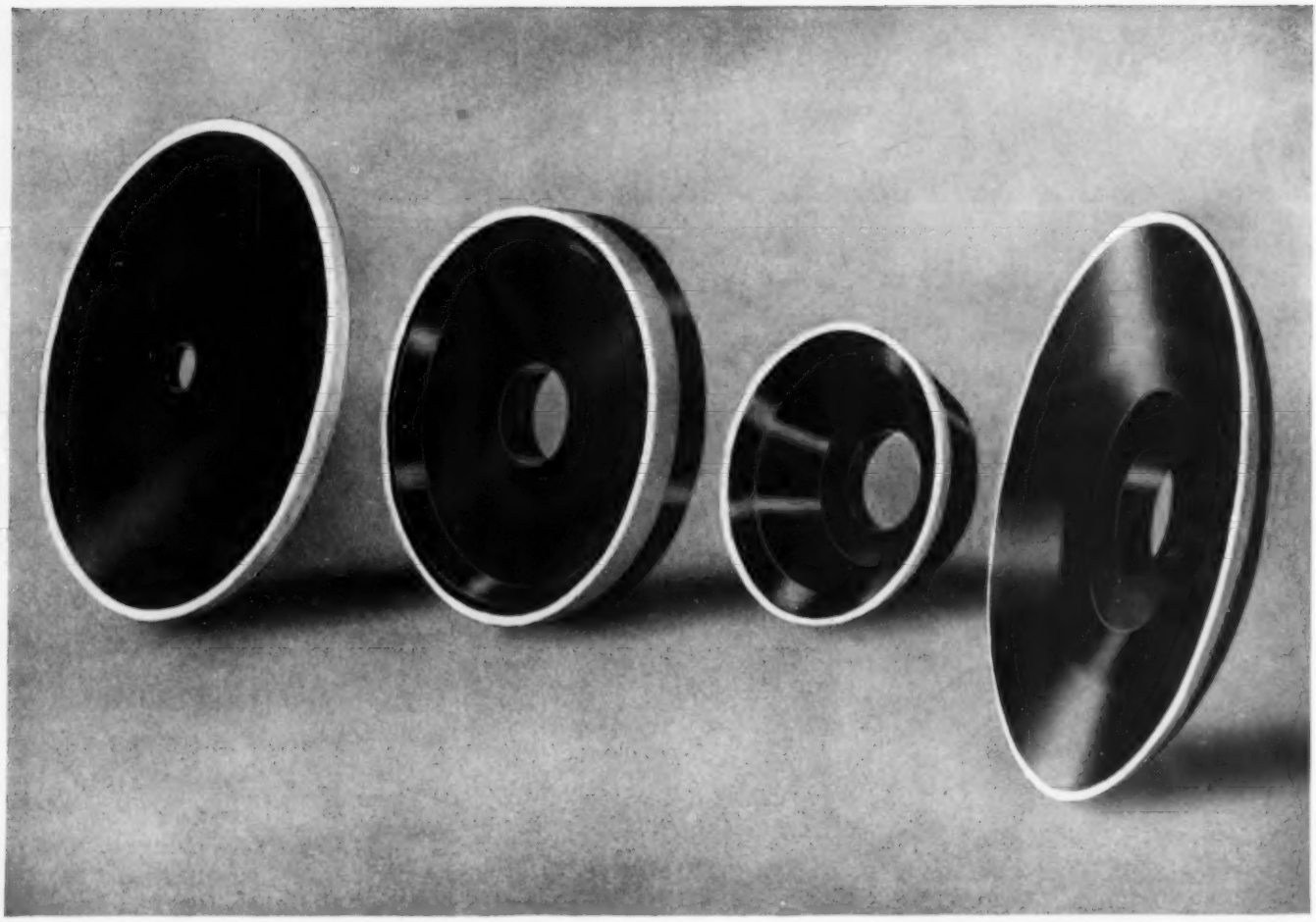

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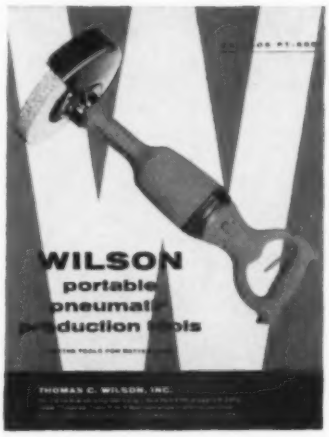
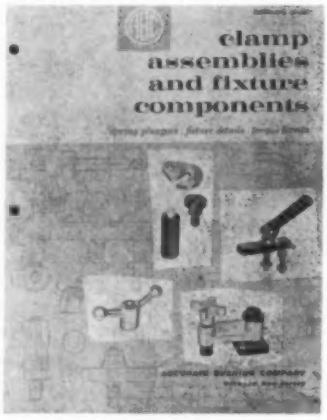
Informative reading in abrasive operations for management, engineering, production.



(See No. 1)



(See No. 3)

(See No. 5)

Portable Production Tools

Use postpaid card. Circle No. 1

Catalog PT-58B, 20 pages long, presents Thomas C. Wilson's line of portable pneumatic production tools. Three major categories are drills, grinders, and accessories. Provides specifications and suggested uses. Thomas C. Wilson, Inc., 21-11 44th Ave., Long Island City 1, New York.

Special Holding Devices

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A 20-page bulletin describing special work-holding devices contains 57 illustrations showing the different types of collet chucks, diaphragm chucks, mandrels, arbors, collets, boring bars, adapters, spindles, and other devices of special design, both power and mechanically operated and engineered. Order on company letterhead. Sutton Tool Company, Sturgis, Mich.

Clamps and Fixture Components

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Catalog No. JF-61 contains complete information and drawings of Accurate Bushing Company's more than 1,000 ABC clamp assembly and fixture component items available from factory stock. Twelve pages. Accurate Bushing Company, 440 North Ave., Garwood, N.J.

Portable Electric Tools

Use postpaid card. Circle No. 4

Seventy-two portable electric tools are described in a 34-page buying guide containing complete information, detailed specifications, applications, and photos of each tool in use. Kits and accessories are described in detail. Porter-Cable Machine Co., Syracuse 1, N.Y.

Polishing, Buffing Lathes

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Osborn polishing and buffing lathes are the subjects of a 4-page bulletin which provides illustrations, descriptions, uses, applications, and special features of Model No. PL-5V22. Osborn Mfg. Co., 5401 Hamilton Ave., Cleveland 4, Ohio.

Tumblers

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Four Delta tumblers are presented in single sheet flyers. Each sheet presents price, specifications, and capacities. Illustrated are Models 100, 200, 300, and 500. Delta Mfg. Co., 1137 W. Hilton, Phoenix, Ariz.

Gear Equipment Selector

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Selector data sheet illustrates typical gears and splines, and shows the best processing method for each depending on high, medium, or low production requirements. Also pictured are 26 basic types of gear cutting, grinding and finishing machines, gear checking equipment, and gear cutters. Michigan Tool Co., 7171 E. McNichols Road, Detroit 12, Michigan.

Safety Cut-Off Wheels

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Six-page bulletin describes and illustrates the line of Dayton safety cut-off wheels. Bulletin is designed to make proper selection of wheels for various applications as easy as possible. Included are suggested specifications for specific applications as well as several hints on proper operation. Dayton Safety Grinding Wheel, Division of Simonds Worden White Company, 1101 Negley Place, Dayton 7, Ohio.

Flex Drum Abrasive Wheels

Use postpaid card. Circle No. 9

Technical Data Sheet No. FD-30 illustrates and discusses features of the Merit Type B flex drum, a super-resilient cloth wheel. Lists grit grades available and describes various configurations of the drum. Also covers rotation speeds and abrasive loading procedures. Merit Products, 3691 Lenawee Avenue, Los Angeles 16, California.

Barrel Finishing

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ALMCO supersheen roll barrels are discussed in a four-page folder. Illustrates seven types of equipment and offers suggested uses of each. Includes specifications of various models with descriptions of operation. ALMCO, Queen Products Division, King-Seeley Corporation, Albert Lea, Minnesota.

Drill Producing Process

Use postpaid card. Circle No. 11

Twelve-page booklet describes and illustrates the Ace "Ground-from-the-Solid" process of producing drills from uniform heat-treated mill length bars of hardened high-speed steel. Also features brief descriptions of Ace drills, reamers, and blanks. Ace Drill Corp., Adrian, Michigan.

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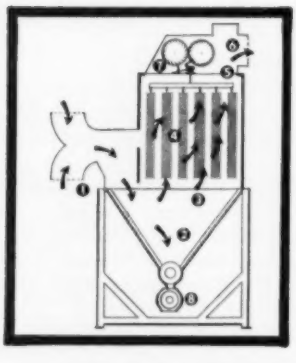

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FREE LITERATURE *continued*

Gage Guide

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The 32-page illustrated Air Gage Engineering and Purchasing Guide is a catalog designed as a tool to help in proper gage selection. It is also a source of basic design data for the gage engineer and complete ordering information for purchasing personnel. Order on company letterhead. Standard Gage Co., Poughkeepsie, N.Y.

Coordinate Measuring

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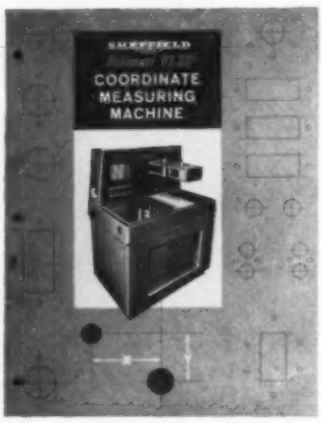
Sheffield's Ferranti FI-22 Coordinate measuring machine is discussed in a 4-page brochure. Describes applications, operation, and advantages and illustrates the machine in use. Sheffield Corp., Dayton 1, Ohio.



Aluminum Finishing Compounds

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Technical data sheet No. 24 lists a full range of aluminum finishing processes, including compounds used in anodizing, bright dipping, burnishing and barrel finishing, chemical milling, chromate conversion coatings, cleaning corrosion protection, deburring, deoxidizing, electroplating, pickling, plating, prepainting, rinsing and drying, spot welding, stripping and surface activation. MacDermid Incorporated, Waterbury, Conn.

Duplex Grinder

Use postpaid card. Circle No. 15

Illustrated, 4-page folder presents complete specifications and details on the new Bryant double end internal grinder. Includes detailed descriptions of machine movements, a schematic, close-up of tooling area, and complete operating specifications. Machine was specifically designed for grinding both a straight and a tapered bore at a single chucking. Bryant Chucking Grinder Company, Springfield, Vermont.

Coolant Filters

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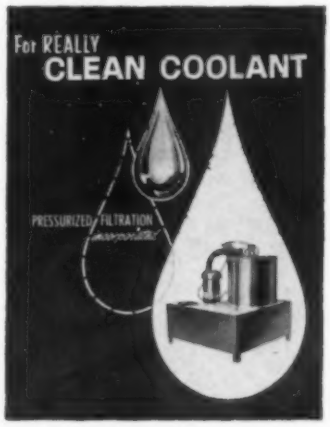
The Model P.F. 3-6-1 and Model P.F. 3-1 coolant filtration units are presented in a 4-page folder. Describes construction, operation, capacities, and abilities of each model. Provides a description of a typical operation. Pressurized Filtration, Inc., 6910 Chase Road, Dearborn, Michigan.



Portable Grinding Wheels

Use postpaid card. Circle No. 17

Safe use of grinding wheels is subject of 20-page brochure from the Grinding Wheel Institute. Charts, tables, and photographs illustrate safe ways to mount and operate portable grinding wheels. Grinding Wheel Institute, Cleveland, Ohio.

Abrasive Supplies

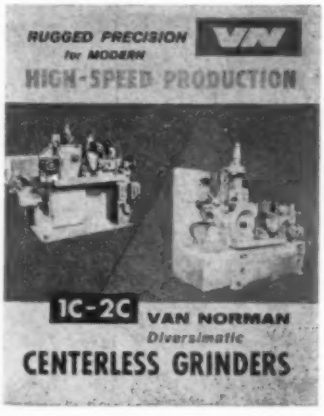
Use postpaid card. Circle No. 18

Grit sizes and styles of abrasive supplies for metallographic and petrographic laboratories are presented according to item, size, grit, code, unit, price, and use. Geoscience Instruments Corp., 142 Maiden Lane, New York 38, N.Y.

Centerless Grinders

Use postpaid card. Circle No. 19

Twenty-eight page brochure describes and illustrates the Van Norman No. 1-C and No. 2-C centerless grinding machines. Versatility, uses, applications, and equipment are also presented. Van Norman Machine Company, Division of Van Norman Industries, Inc., Springfield 7, Massachusetts.



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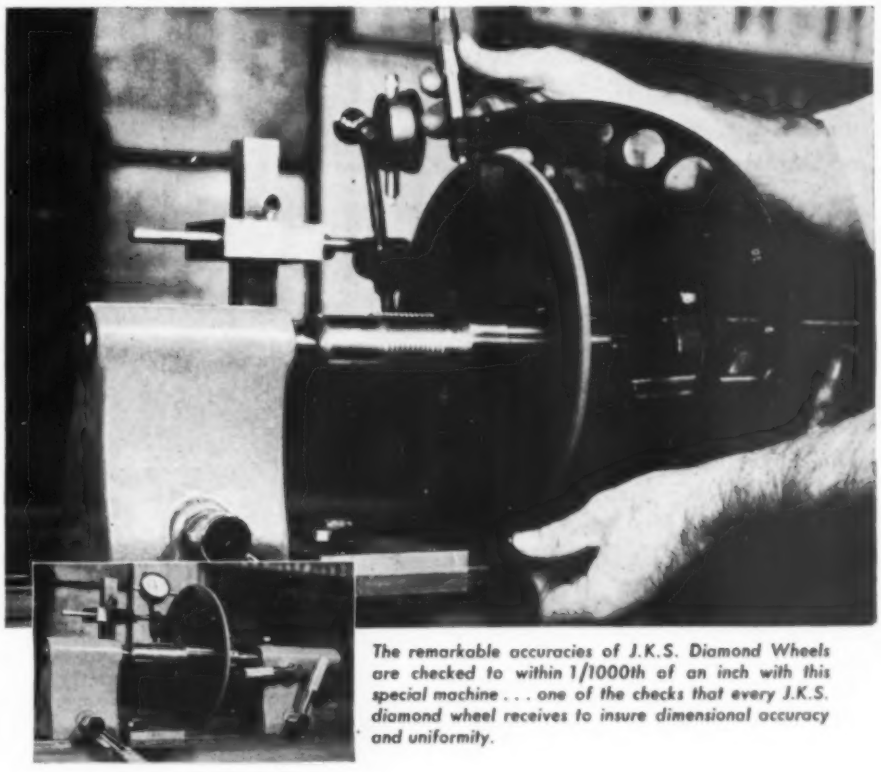

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Olson's all-new Conveyorized Settling System makes the settling operation 70-90% efficient, depending on the viscosity of the coolant and size, weight, and nature of the contaminating particles. Operation is automatic from the start to the point of dropping sludge into the sludge disposal container. The system entails no servicing, such as adjusting or changing a filter medium. Only occasional emptying of the sludge pan is required.

The conveyor ramp can be built to extend upward to discharge at any height above floor level. Conveyor flights, chain and sprockets are made extra sturdy to handle the heaviest sludge load conceivable in a settling operation.

The Olson Conveyorized Settling System is available in tank sizes with holding capacities of 250 to 5000 gallons to suit your needs—whether applied to individual machines or central systems. For complete information, mail the coupon today.

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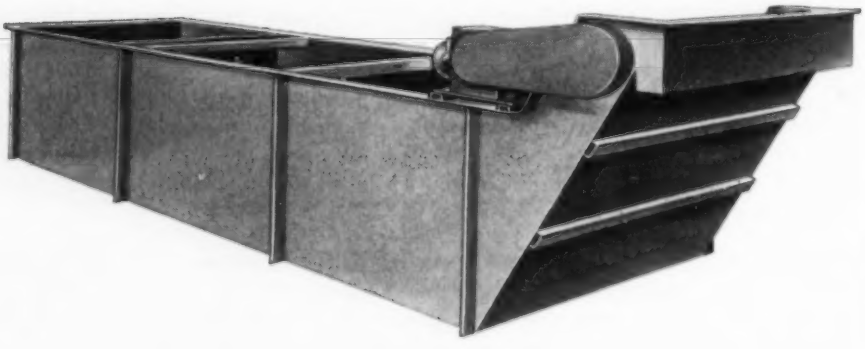

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*City*_____ *Zone*____ *State*_____

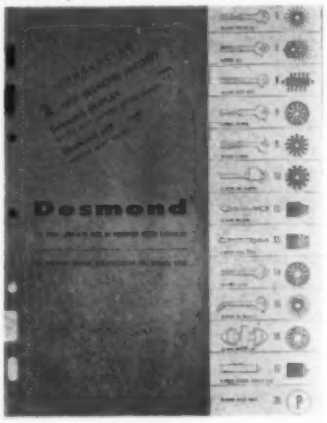
Use postpaid card. Circle No. 232

FREE LITERATURE *continued*

Dressers

Use postpaid card. Circle No. 20

Catalog No. 75 announces and describes two new Desmond grinding wheel dressers—the Desmond duplex flexible shaft portable grinder dresser and the Desmond MI mounted point dresser. Also provides descriptions and applications of other Desmond dressers and cutters. Desmond-Stephan Mfg. Co., Urbana, Ohio.



Magnetic Separators

Use postpaid card. Circle No. 21

Four Sundstrand coolant separators are presented in a 4-page brochure. Illustrates uses and installations for magnetic separators available in 25, 50, 75, and 100 gpm capacities. Also presents features and specifications for the four models. Sundstrand American Broach, Division of Sundstrand Corporation, Magnetic Department, Ann Arbor, Mich.

Indicator Spline Gage

Use postpaid card. Circle No. 22

Four-page illustrated bulletin SP615 describes uses and features of the new Vinco Splinedicator, bench type and portable units. Exploded view of units illustrates utilization of the gage. Vinco Division, Vinco Corporation, 9111 Schaefer Hwy., Detroit 28, Michigan.

Wheels and Segments

Use postpaid card. Circle No. 23

Illustrated brochure outlines complete range of American Emery's vertical spindle surface grinding wheels and segments. Describes and pictures various segment shapes, bonds, and abrasives available, together with their work applications and advantages. Similar treatment is given to American's cylinder wheels with emphasis placed on the new hexilinder wheel. American Emery Wheel Works, Providence 1, Rhode Island.

Air Chucks

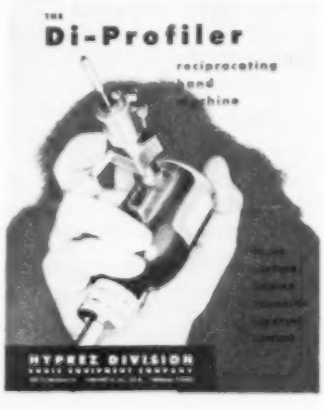
Use postpaid card. Circle No. 24

Two-color, four-page bulletin describes three styles of air chucks for work or tool holding in rotating or nonrotating applications. Engineering drawings show how chucks work. Also contains complete specification table of Erickson collets and illustrates several money-saving applications of the air chucks in precision high-production work. Erickson Tool Company, 34350 Solon Road, Solon, Ohio.

Di-Profiler Accessories

Use postpaid card. Circle No. 25

Eight-page booklet illustrates and describes techniques and accessories for Engis Equipment Company's Di-Profiler reciprocating hand machine. Also shown are complete Di-Profiler sets, which include electrical equipment and selected accessories. Hyprez Division, Engis Equipment Co., 431 S. Dearborn St., Chicago 5, Ill.



Save up to 50% on grinding time . . . up to 50% on abrasive costs!

Take an AA1 chuck, load it up with FM quick-change segments, and you've got a cost-cutting, production-boosting combination that can give you **amazing** results . . . like these reported by present users: "AA1 chucks and segments doing a 150% faster job with no loading, no dressing. Segment life is 2½ **days** per set as against 4 to 5 **hours** previously." "Saving 30% in direct labor and 35% in abrasive costs. More accurate grinding due to cooler cutting and less distortion." "Saving $16 a day on segments, yet getting better quality, faster production, with AA1-FM." "70% reduction in inventory due to one FM segment shape and size for wide variety of machines."

Here's the secret: **exclusive** circular echelon arrangement and novel segment design produce much faster cutting; throw off chips and grinding residue. AA1 design and FM segment shape give you lowest cost per cu. in. of usable abrasive.

Lots more, too. See for yourself how the mighty FM-AA1 combo cuts your costs . . . pays for itself in no time. Give it a whirl. Write today!

For practically all Surface and Face Grinders!

FM

LITERATURE ON REQUEST.

THE FULLER MERRIAM COMPANY 72 Water St. West Haven, Conn. Telephone WEst 3-2501

A GUIDE TO GRINDING WHEEL SELECTION is available on request.

Use postpaid card. Circle No. 233

FREE... Case Histories

How HOFFMAN Filtration Equipment ELIMINATES HIDDEN METALWORKING COSTS

TODAY'S high costs make it imperative to take a good hard look at metalworking tools and techniques—call for the elimination of unnecessary and often hidden expenses in the production process.

What Dirty Coolant Means to You

In many instances, the responsibility for hidden costs can be found in dirty coolant. Grinding and finishing machines as well as various cutting tools originally tested for performance with clean coolants can not function near rated capacity when the coolant contains metal chips, solid abrasives, grit, dirt and fine particles. Contaminated coolant is responsible for numerous hidden costs including *shorter tool and wheel life, frequent down time for wheel dressing, tool sharpening and sump tank cleaning.* Dirty coolant also means *higher labor and material costs, shorter useful life of oil and coolants, poor product finishes, excessive maintenance costs and an undesirable percentage of rejects.*

Benefits of Clean Coolant

Hoffman filtration equipment eliminates hidden costs — delivers the clean coolant that makes all the difference in output and profit ratios — enables you to achieve these metalworking goals:

- Greatly reduced down time
- Higher speeds—faster feeds
- Improved finishes — fewer rejects
- Longer useful life of coolants
- Extension of edge tool life
- More sustained tolerances
- Fewer stoppages and adjustments in the machine
- Considerable reduction in scrap loss
- Elimination of motor pumps
- 25 to 50% savings in grinding wheels, honing stones, broaches and individual machine tools

To check on the advantages and benefits of individual and central filtration systems, send for these FREE case histories.

☐ How a Hoffman Central Filtration system raises automatic screw machine precision standards, lowers production costs at Teal Machine Company, Inc.

☐ How a Hoffman Central Flotation System saves materials, cuts maintenance costs in grinding machine applications at the General Railway Signal Co. plant.

☐ How a Hoffman Central Flotation System saves International Harvester over $70,000 annually in grinding operations.

☐ How a Hoffman Central Filtration System for thread grinding oil provided a 100% increase in grinding wheel life, a 30% production increase and a 75% overall improvement in operations at Electric Auto-Lite.

☐ How a Hoffman Central Filtration System improved finishes, reduced rejects, saved oil and abrasive belts, eliminated a fire hazard and reduced operating costs in flat rough and flat finish polishing at a large automobile plant.

☐ How a Hoffman Central Flotation System insures continuous operation of high precision machining operations in the automated plant of a leading manufacturer of automobiles.

☐ How a Hoffman Central Filtration System saves the Utica Drop Forge Division of the Kelsey-Hayes Co. an average of $125,000 yearly on drive wheels, contact wheels, ball bearings, oil and maintenance in the rough and finish grinding of jet engine blades.

☐ How a Hoffman Central Filtration System installation at the plant of a leading manufacturer of automotive and aircraft accessories paid for itself in one year through savings on labor costs, grinding oil, grinding wheels and improved quality.

☐ How a Hoffman Industrial Vacuum Distillation System recovers contaminated solvents to new solvent specifications at a cost of 1¢ per gallon.

Write on company letterhead for free case histories and information on how your plant can benefit through the use of Hoffman filtration systems.

FILTRATION DIVISION

HOFFMAN

INDUSTRIES, INC.

A subsidiary of Hoffman International
Thompson Road Plant #1
Syracuse, New York HO 3-0251

Use postpaid card. Circle No. 234

FOURTH NATIONAL CONVENTION AT ATLANTIC CITY

Talks by **Albert Meade,** chief metallurgist, Grumman Aircraft Engineering Corporation, and by **Milton E. Annich,** director of industrial engineering, American Brakeshoe Co., Mahwah, New Jersey, and vice president of the national ASA, headlined the program of the fourth national convention at Atlantic City, N.J., April 22, 1961. Sixty-two delegates, members, and directors attended.

Meade sketched the history of rocketry from its infancy to the present Redstone and Atlas missiles.

Annich outlined the place of the abrasive industry in overcoming competitive complacence in this country and in meeting foreign competition.

Joseph Cognata of Cleveland and **M. M. Patterson** of Chicago were elected national directors for five years, and **Patrick J. Pascucci,** for three.

In his President's Report, **James Bair** noted the progress made during the past year and urged increased efforts to meet the society's goals.

CONNECTICUT ELECTS; TALKS BARREL FINISHING

Harold D. Rivers, last year's vice president, was elected president, and **Fred K. Emonds,** vice president, at the Connecticut chapter's April meeting. **N. L. Watkins,** product manager for barrel finishing, Electro Minerals Division of The Carborundum Company, Niagara Falls, N.Y., was the speaker, 103 members and guests.

Other officers for 1963 are **Bert Broekhuysen,** re-elected as secretary, and **Warren Hessels,** treasurer.

Directors for terms ending in 1962 are **Pat Pascucci, Charles Sadler,** and **James McGregor.**

Directors for terms ending in 1963 are **John McShea** and **Andrew Saman,** last year's president and treasurer, respectively, with **Walter E. Vance** and **Norman Clark.**

KNAPP BOOSTS ABRASIVE MACHINING AT DETROIT

Speaking at the Detroit chapter's late April meeting at the Warren Valley Country Club, **William C. Knapp,** metalworking sales manager for Mattison Machine Works of Rockford, Ill., compared abrasive machining with other forms of metal cutting. He emphasized the part played by high horsepower and rigid construction in full utilization of today's grinding wheels.

SAGINAW VALLEY HOLDS DANCE

About forty members and guests of the Saginaw Valley chapter attended the annual dance, held April 15 at the VFW Hall in Fenton, Mich.

CHICAGO: COOLANT CLEANING

Chicago Chapter No. 13 discussed the cleaning of grinding and finishing coolants at its meeting on Thursday, May 11. **Arthur L. Wilson,** engineering manager, Industrial Section, Olson Filtration Engineers, Cincinnati, Ohio, was the speaker. Wilson was formerly with Barnes Drill Company, Rockford, Illinois. About 50 members and guests attended.

Technical chairman for the meeting was **M. M. Patterson,** editor of GRINDING and FINISHING magazine.

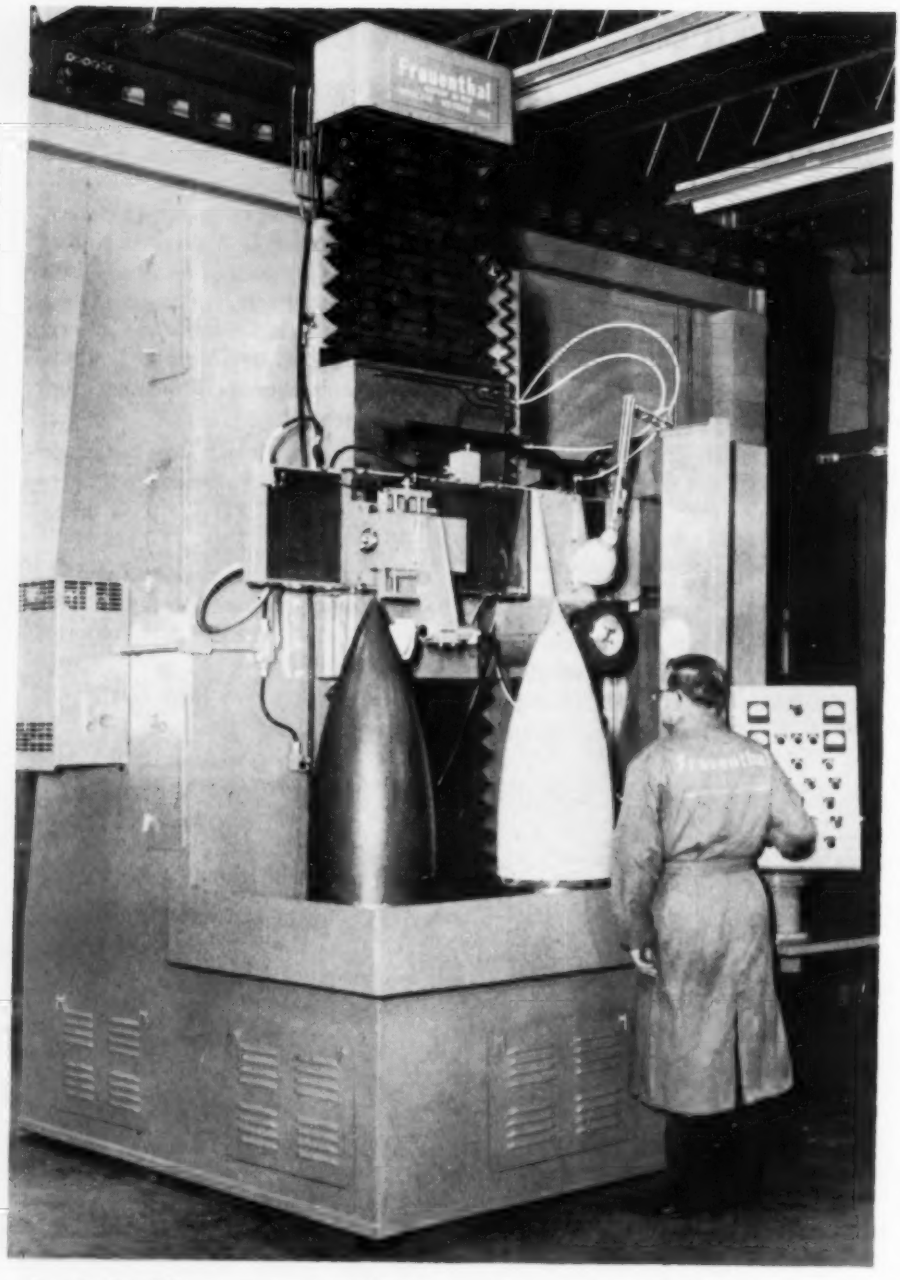
Robert S. Hanke, president and the chapter's only delegate to the national convention at Atlantic City, reported on his trip.

The meeting was held at the Old Spinning Wheel, Hinsdale.

Officials of Carpenter Steel of New England pose with Connecticut ASA officers during March plant visit. From left: James MacMinn (Carpenter) superintendent, Cold Finishing Division; Andy Saman, treasurer; Harold Rivers, vice president; Pat Pascucci, past president; Charles Sadler, board; John McShea, president; Bert Broekhuysen, secretary; George Farren, board; and Paul Harter, (Carpenter) assistant superintendent, Cold Forming. (ASA titles as current in March.)

Equipment and Materials

DUAL TABLE GRINDER USES THREE-DIMENSIONAL MASTER



A dual-table contour grinding machine uses a three dimensional master on the first table to produce a duplicate on a second table. The machine, employing an automatic electro-hydraulic tracer system, can produce a finish within ±.0005".

For other applications, a grinding spindle may be added to use with the second table for grinding two identical parts, one on each table.

The machine, Model 926, was designed to grind Pyro-Ceram nose cones, but may be adapted for other parts.

The axes of the two work table spindles are parallel to each other and to the vertical slide ways within .002" in 20". The 15" diameter tables rotate together in the same direction in a 1:1 ratio.

Table speed is variable from 2 to 17 rpm with constant sfm control. Both tables are equipped with vacuum chucks and the table drive mechanism is completely enclosed and sealed against possible damage from grinding particles and moisture.

Maximum vertical travel of the horizontal slide is 55" with the variable vertical feed rate from .025" to 5" per minute plus rapid traverse. Vertical and horizontal slides are electro-hydraulically controlled by a Frauenthal "trans-axis" tracer servo system.

The hydraulic control of this system guides both vertical and horizontal travel simultaneously through 180° of motion with constant stock removal speed on all surfaces of the the work pieces.

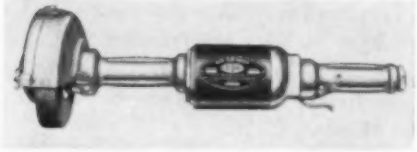
Vertical design eliminates deflection of the work piece and design also reduces floor-to-floor time, since parts are easily loaded, quickly centered, and can be simply, quickly checked.

Models to meet other specifications are also available with work tables up to 178" diameter with spindles for boring, turning, polishing, and thread grinding.

Frauenthal Division, The Kaydon Engineering Corp., Muskegon, Mich.

Use postpaid card. Circle No. 26

HORIZONTAL AIR GRINDERS



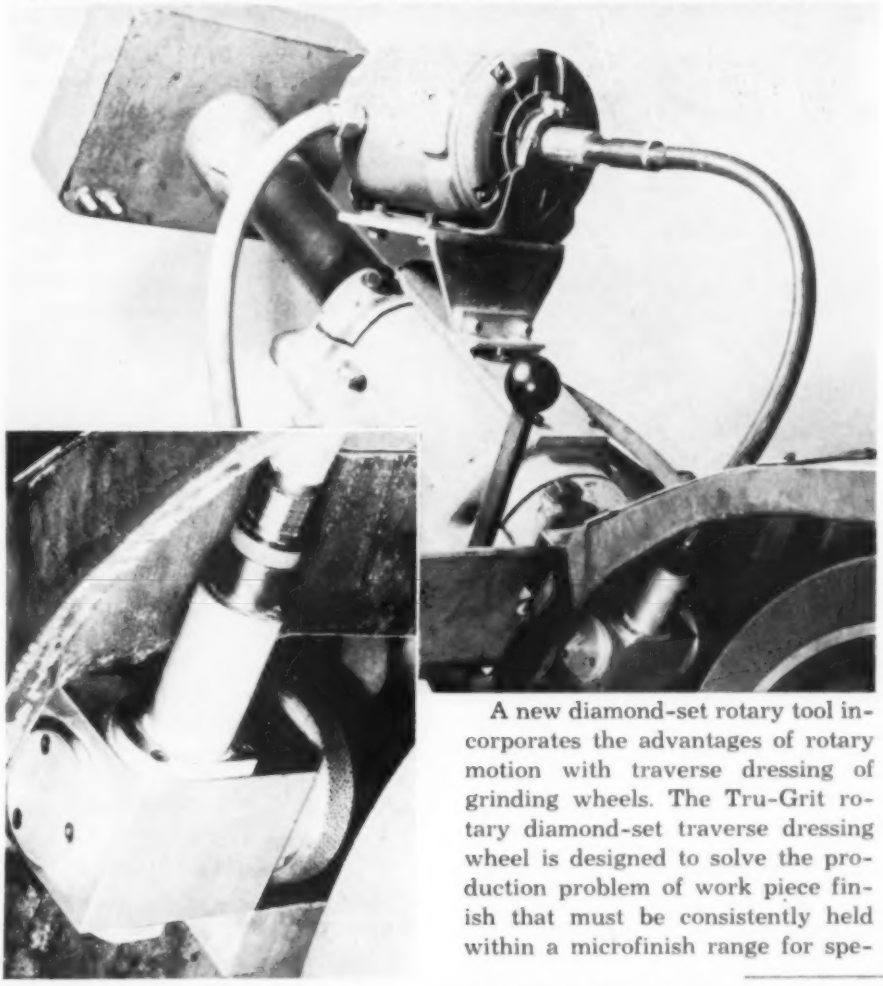
Both the Model 517 and Model 541 Sioux horizontal air grinders can be used for wire brushing and buffing as well as for horizontal grinding.

The 517 is available with speeds of 4,500 or 6,000 rpm with 6" grinding wheel and 9,000 rpm with a 4" wheel. The 541 operates at 4,250 rpm with an 8" wheel and at 6,000 rpm with a 6" wheel.

Albertson & Company, Inc., Sioux City, Iowa.

Use postpaid card. Circle No. 27

TOOL INCORPORATES ROTARY MOTION, TRAVERSE DRESSING



A new diamond-set rotary tool incorporates the advantages of rotary motion with traverse dressing of grinding wheels. The Tru-Grit rotary diamond-set traverse dressing wheel is designed to solve the production problem of work piece finish that must be consistently held within a microfinish range for specific purposes without sacrificing other tolerance limitations.

The tool, powered independently and traversing at regular intervals across the full face of a grinding wheel, can maintain a specific finish on the work piece within a range of 30 to 50 rms. At the same time, a taper-free straight surface is obtained within .0002" and the geometrical roundness of the part diameter held within .0002".

Data compiled on an application on a Landis No. 12½ centerless grinder indicated a high degree of efficiency.

A Tru-Grit rotary diamond-set traverse dressing wheel was installed and accomplished 10,931 dressings resulting in production of more than 1.3 million valves before removal. The finish produced was constantly within the specified tolerances of 30 to 55 rms while the .0002" diameter roundness and .0002" taper-free straight surface was maintained.

Already available in a traverse-rotary unit, actuated by the grinding wheel, the tool is designed to maintain a 12-18 rms surface finish.

Wheel Trueing Tool Co., Detroit, Michigan.

Use postpaid card. Circle No. 28

CLAMP LOCKS ELIMINATE BOUNCE OR RECOIL

A new series of air or hydraulic-operated toggle clamps feature over-center toggle locks that eliminate bounce or recoil.

They are work-rated with holding pressures to 450 lbs. at 80 lbs. line pressure, and can be used individually, in series, sequentially, or simultaneously.

Detroit Stamping Co., 330 Midland Avenue, Detroit 3, Mich.

Use postpaid card. Circle No. 29

ADJUSTABLE SUCTION TUBE

A fully adjustable suction tube assembly for unit-type industrial dust collectors eliminates the need for expensive permanent ductwork and increases efficient use of cabinet cloth filter collectors.

The tube consists of a flexible, tough fabric hose supported by lightweight arms which pivot to allow movement to any desired position. The assembly is equipped with a highly efficient dust nozzle.

Torit Manufacturing Co., 1133 Rankin St., St. Paul 16, Minn.

Use postpaid card. Circle No. 30

NYLON ABRASIVE BELT HAS WIDE APPLICATIONS

A nylon abrasive belt that produces a microfinish in polishing excels in applications requiring fine finishes on irregular surfaces.

The belt is highly heat resistant and does not load-up readily. It is made by spraying a slurry of grain (either aluminum oxide or silicon carbide) and a flexible adhesive on a non-woven, random fibre nylon web. The web is then laminated to a cloth backing and fabricated into an endless belt.

Due to relatively large openings between the nylon fibres, the material being ground cannot lodge and build up on the belt. Heat generated during grinding operations dissipates readily as air enters between the fibres.

The pliability of the web, the

continued

flexible adhesive, and the cloth backing enable the belt to conform readily to irregular surfaces.

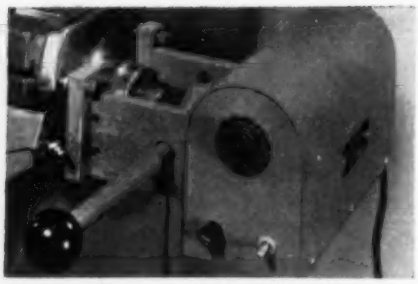
The new nylon abrasive product is also being offered in sheet, disc, and roll forms.

Coated Abrasives Division, Armour Alliance Industries, Alliance, Ohio.

Use postpaid card. Circle No. 31

ATTACHMENT FITS ON MILL TABLE

The M & M Roto Power attachment can be attached to rotary tables, vertical mills, grinders, and



many other special applications requiring power feeds.

The attachment, for hand-operated machines, has a slip clutch to protect the motor drive and to allow the machine to drive up to a stop.

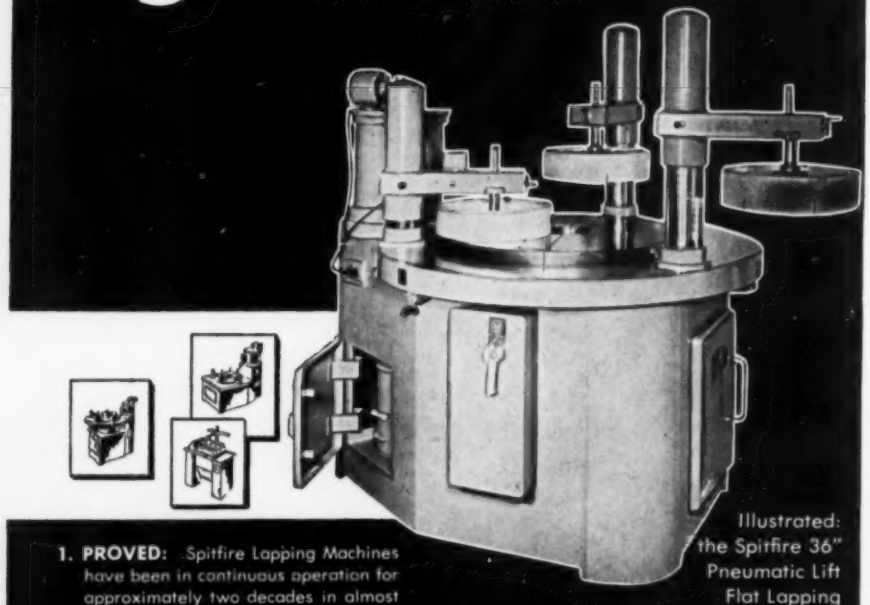
A hand-shift lever can be purchased to disengage the unit. The variable control motor suits many applications.

M & M Tool & Mfg. Co., 1124 E. Third St., Dayton 2, Ohio.

Use postpaid card. Circle No. 32

SPITFIRE

1 2 3 basic reasons Lapping is now a standard



Illustrated: the Spitfire 36" Pneumatic Lift Flat Lapping Machine

1. **PROVED:** Spitfire Lapping Machines have been in continuous operation for approximately two decades in almost every phase of industry... built-in quality and precision, experienced engineering assure demanded reliability.

2. **NEED:** Quality control requirements for lapping to thousandths of an inch precision has become increasingly necessary. Literally any piece part produced of any material is quickly, accurately, economically lapped and/or finished in small or high volume production with Spitfire machines.

3. **COMPLETE LINE:** from small bench type 6" roller lapping machines to 48" pneumatic flat lapping machines.

Write for free Spitfire Catalog.

SPITFIRE

TOOL & MACHINE CO.
2931 N. Pulaski Rd.
Chicago 41, Illinois
Phone: AVenue 6-1610

Use postpaid card. Circle No. 236

SINGLE HEAD MACHINE SIMPLIFIES TOOL FINISHING

The single head Grind-A-Lap, with quick change ring-type wheels, grinds and laps carbide, H.S.S., and ceramic tools. Alnico magnets, set into the head, hold wheels firmly and accurately and permit instant changing with fingers only.

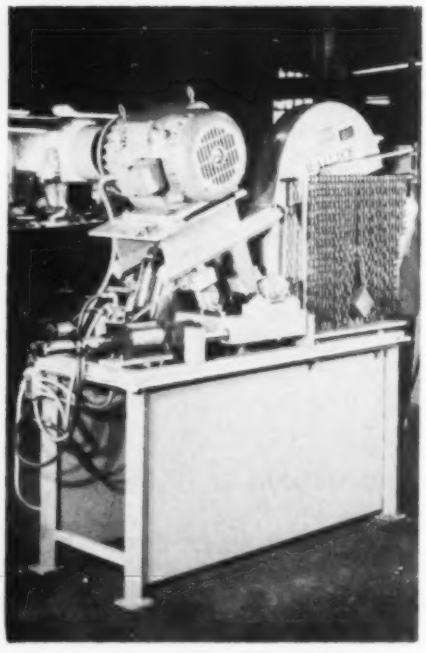
The unit's wide base protractor has an attached pivot bar which rotates 180° and sets and locks in any position. The head revolves with an oscillating pendulum motion, moving the wheel with a 3-directional stroke across the tool face.

The tool to be sharpened is placed against the pivot bar and is automatically in position for the entire grinding or lapping operation. A tilt-table, operated by a single handle, registers the degree of tilt automatically on a dial at the side of the machine. The machine features a new type of grinding wheel, plated with a solid concentration of diamonds, which grinds cool and never needs to be dressed.

Leonard Precision Products Co., Grind-A-Lap Division, 9200 Bolsa Ave., Santa Ana, Calif.

Use postpaid card. Circle No. 33

PROVIDES AMPLE POWER TO TEST 26" WHEELS



The Series 1510 Cutting Unit provides ample power (25 hp) to test wheels up to 26" diameter as a straight chop-stroke unit, or it can be set to oscillate from 1 to 100 strokes per minute. The stroke length can vary from ½" to 6".

Solid rounds to 6" diameter in most types of steel alloys can be cut

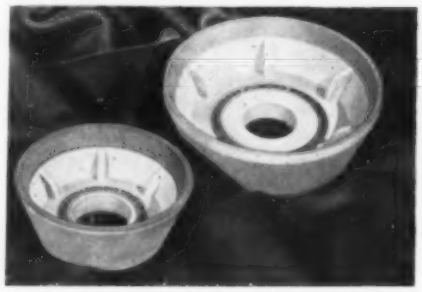
to about 2 to 3 seconds per square inch. With proper work holding fixtures, it can cut 10" channels.

The units are available with 18", 20", and 26" wheels. A similar machine series for wet cutting covers the same range of wheel sizes plus one larger—34" diameter.

Wallace Supplies Mfg. Co., 1304 W. Diversey Parkway, Chicago 14, Illinois.

Use postpaid card. Circle No. 34

COOLER OPERATION WITH NEW DIAMOND WHEELS



Turbogrind D11V9 diamond wheels successfully eliminate excessive heat, both in the workpiece and in the bond by use of integrated vanes which vortex laminar air into an effective coolant flow.

The redesigned thinner core, strengthened by the vanes, cools faster and is self dressing. The wheels can be used in wet, mist, or dry grinding.

United States Diamond Wheel Co., 835 Illinois Ave., Aurora, Ill.

Use postpaid card. Circle No. 35

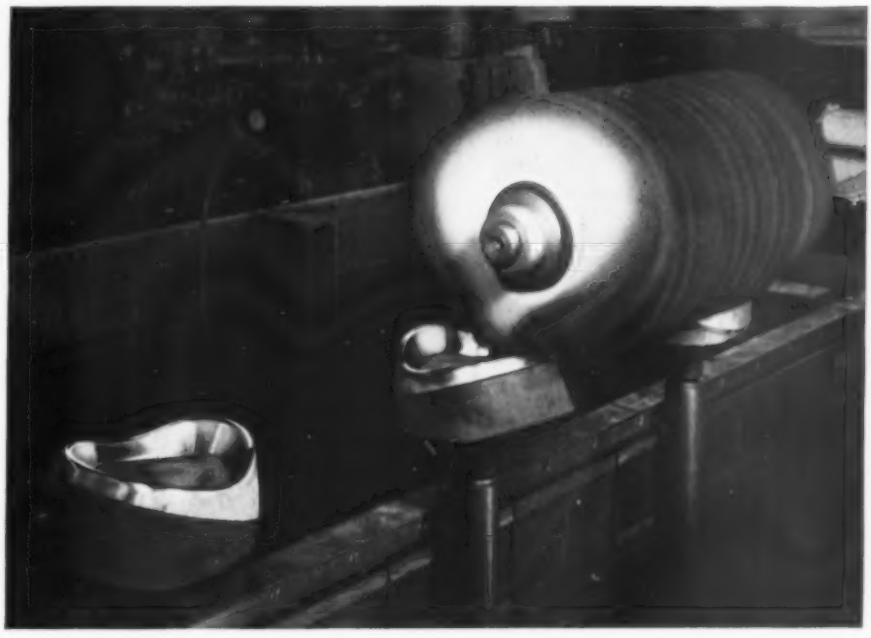
ARC LIGHT AIDS OPTICAL INSPECTION

Mercury arc light equipment is now available to give greater clarity and sharpness of screen illumination.

Contour projectors may be purchased with mercury arc light equipment. Existing projectors manufactured by Ex-Cell-O and those formerly made by Kodak can be easily converted.

The mercury arc light, having an intrinsic brightness 45 times that of a standard tungsten filament, is

ACME IN ACTION



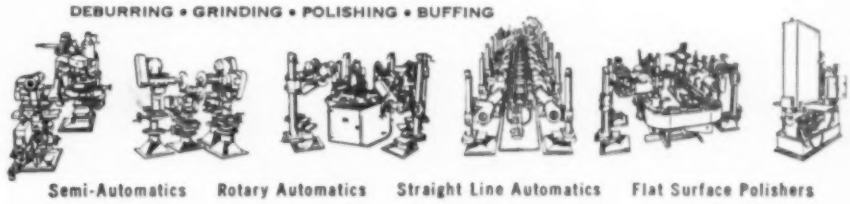
Doing more work with *Movement and Motion*

Good example of versatility in quality finishing equipment is the Acme Automatic Straight-Line Machine shown in action above. It's the "universal" type—one of many basic modular unit designs pioneered by Acme during the past 50 years to do more work better with movement and motion.

Made of standard sections assembled to any length desired, it can incorporate any number and combination of standard adjustable Acme heads designed to perform a variety of operations on a wide range of parts. Deburr, grind, polish and buff. Work-holding fixtures can be arranged for automatic lock and unlock. And the parts themselves can be run in a fixed position, rotated in one or both directions, or cammed as may be required to finish specific areas, assure ultimate uniformity of product quality.

Other types of Acme automatic straight-line polishing and buffing machines include Reciprocating, Fixture-Return, Horizontal-Return, Over-and-Under, Rotary and Rectangular. Send for complete information today!

DEBURRING • GRINDING • POLISHING • BUFFING



Semi-Automatics Rotary Automatics Straight Line Automatics Flat Surface Polishers

Comprehensive catalogs available upon request. Write, wire or call:

ACME MANUFACTURING COMPANY

1400 E. 9 Mile Road • Detroit 20 (Ferndale), Michigan • JOrdan 6-1550

Leading Producers of Automatic Polishing, Buffing and Deburring Machines Since 1910

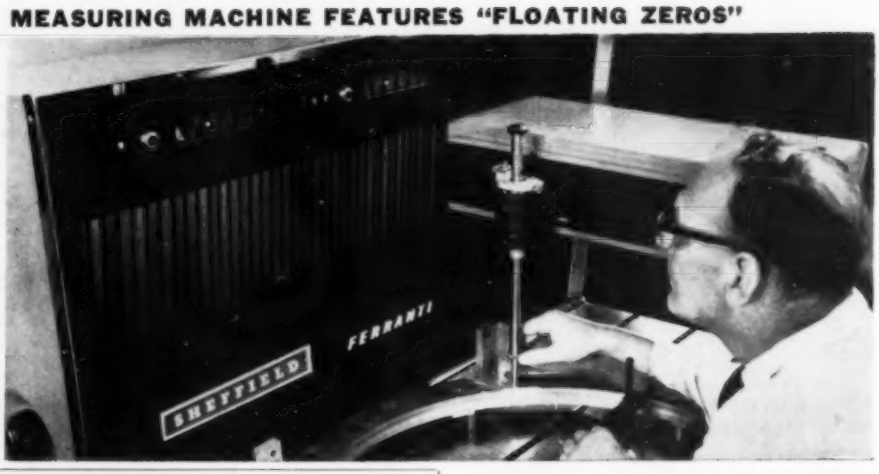
Use postpaid card. Circle No. 237

recommended for use at magnifications of 20X and over on 14" projectors and 50X and over on 30" projectors. The new light can also be used on lower magnifications by setting a switch on the power supply unit to "low intensity."

Ex-Cell-O Corporation, 1200 Oakman Blvd., Detroit 32, Mich.

Use postpaid card. Circle No. 36

MEASURING MACHINE FEATURES "FLOATING ZEROS"



A unique feature of the Sheffield Ferranti FI-22 coordinate measuring machine is the use of "Floating Zeros" that enable the inspection operation to begin anywhere within the 15" by 24" gaging range, thus speeding up the operation.

The machine measures the distance between holes and surfaces in two dimension (X and Y) to an accuracy better than .001. The answers are flashed out on two illuminated digital readout panels.

The machine can also be used for layout and scribing, to centerpunch precision parts, and, with accessories to handle other inspection and layout problems.

The Sheffield Corp., Dayton 1, O.

Use postpaid card. Circle No. 37

CENTERLESS BELT GRINDING:

precision method for faster, lower cost stock removal!

The Sundstrand Model 6120:

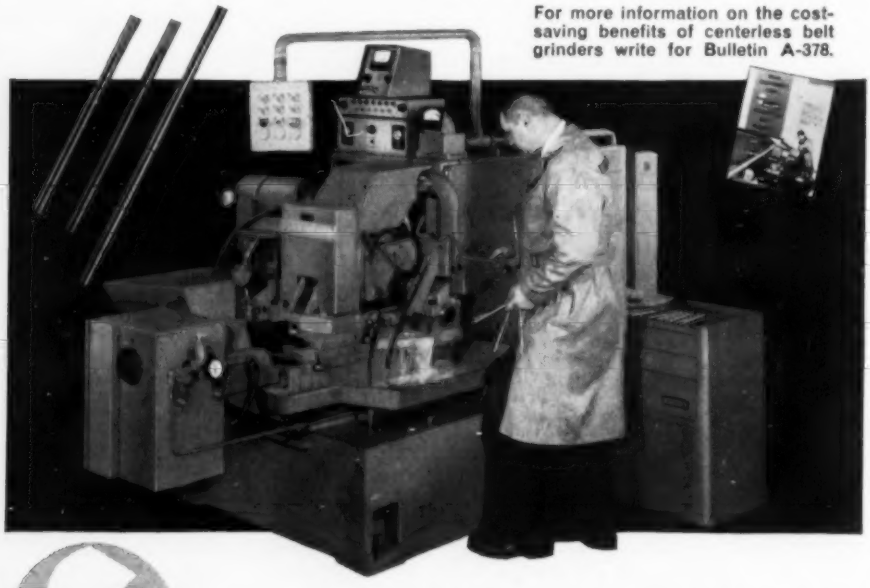
- **For ruff, semifinish, and finish grinding of 1/4 to 4-1/2" diameter bar stock, thin-wall tubing, shafts, pistons, and other cylindrical stock.**
- **Feeds work at rates from 2 to 30 ft. per minute.**
- **Can be set up complete in 15 minutes.**
- **Optional AUTOMATIC precision size control holds tolerances from ± .0002" TIR.**
- **Optional reverse feed mechanism provides through feed grinding in either direction.**

The new Sundstrand-Engelberg Model 6120 centerless belt grinder removes metal faster and at lower cost than any other grinding method. The "throw-away" abrasive belt operates at 4500 sfpm . . . never needs truing or dressing . . . is available in grits to produce any required surface finish on any material.

A resilient rubber-covered contact wheel backs up the belt, eliminates chatter, and compensates for stock irregularities which are difficult to grind with hard wheels. A coolant system assures high production and fine finishes.

The machine is available with tandem heads to perform ruff, semi-finish, and finish grinding in a single pass. Other models are available to handle work from 3/32 to 8½" in diameter.

For more information on the cost-saving benefits of centerless belt grinders write for Bulletin A-378.

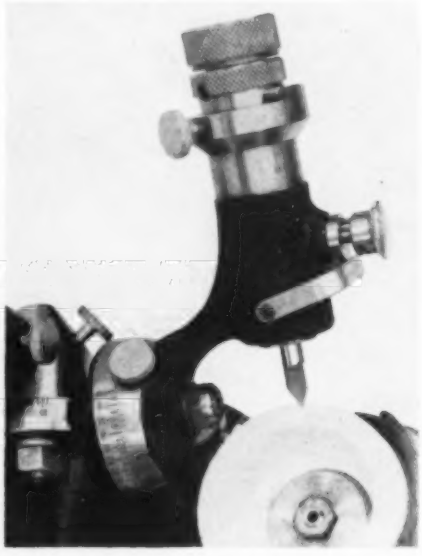


SUNDSTRAND ENGELBERG

SUNDSTRAND MACHINE TOOL
BELVIDERE, ILLINOIS
Division of SUNDSTRAND CORPORATION

Use postpaid card. Circle No. 238

CUTTER GRINDER FOR ANY PROFILE



The Universal Cutter Grinder is capable of grinding any profile. It is equipped with a universal cutter head which permits the operator to sharpen single lip cutters to any side angle or shape, including ball or round nose cutters. Accurate side clearances and tip or end rake are

achieved without removing the cutter from the collet.

The cutter head is equipped with an index unit for grinding 2, 3, or 4-sided cutters. The head is graduated from 0 to 90° for side angle, from 0 to 45° for side clearance, and from 0 to 35° for tip or end rake.

The grinding wheel is cup shaped, has a 2¼" diameter, and is mounted directly on the ball bearing motor which operates it at 10,000 rpm on any A.C. or D.C. outlet.

H. P. Preis Engraving Machine Co., 223 U. S. Highway 22, Hillside, New Jersey.

Use postpaid card. Circle No. 38

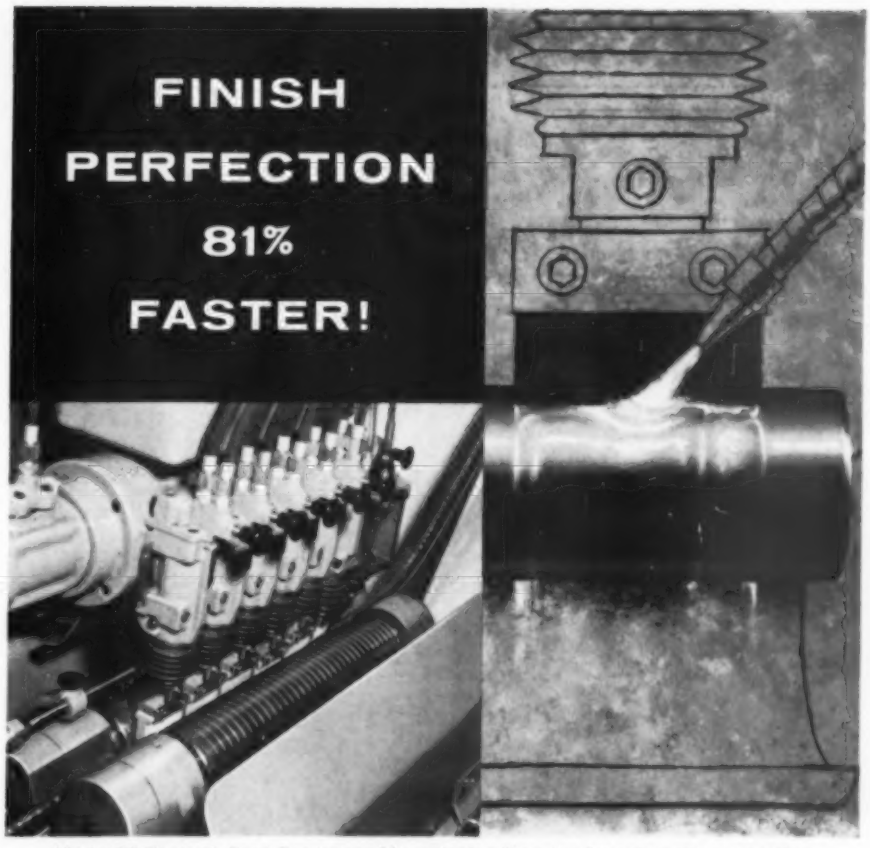
BALANCER REEL FOR SMALL TOOLS

Two completely new, small sizes of portable tool balancers for suspending small portable power tools on production and high speed assembly lines have load capacities of from 0 to 2 lbs. and 0 to 4 lbs.

Simply and properly adjusted, tools become weightless, and reduce operator fatigue, especially on high production lines. All parts are replaceable. A suspension clevis can be adjusted to provide straight line cable action.

Aero-Motive Mfg. Co., 1803 Alcott St., Kalamazoo, Mich.

Use postpaid card. Circle No. 39



Model 88 Through-Feed Centerless Microstoning Machine for automatic production and Microstoning head of the Model 9681 Microstoner, for attachment to lathes and other machine tools.

Microstoning Produces Controlled Microinch Surfaces Fast, Precisely, Profitably

Remarkable but true . . . operations are eliminated with Microstoning. You get results at least equal to — but usually much better than — you get with costly, time-consuming precision machining, grinding and handwork. And you get these results in the shortest possible time: One company cut finishing time from 30 hours to 4 hours, another from 30 seconds to 5 seconds!

Microstoning is the exclusive Taft-Peirce/Supfina process in which special Microstones in a wide range of grits and bonds oscillate pneumatically against work pieces. They take the shape of the work, reduce geometric error — in cylinders, out-of-roundness — to a minimum. Microstoning brings work from relative roundness to any desired finish — even fractional microinch if specified — in one quick cycle.

Ask your Taft-Peirce agent to demonstrate how you can *improve quality* while *reducing costs* with Taft-Peirce/Supfina. Or write for detailed information.

Finish it with

TP1-3

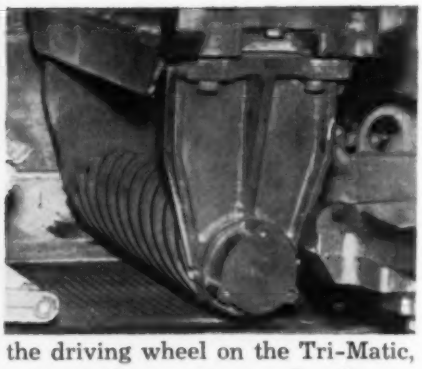
TAFT-PEIRCE *SUPFINA*

TAFT-PEIRCE MANUFACTURING CO. 19 MECHANIC AVENUE, WOONSOCKET, R. I.

Use postpaid card. Circle No. 239

CONTACT WHEEL SPEEDS ROUGH GRINDING WORK

Rough grinding work can be done faster with a new 3" diameter contact wheel recently developed for use on the Tri-Matic oscillating belt grinder in place of the standard 7" diameter wheel.



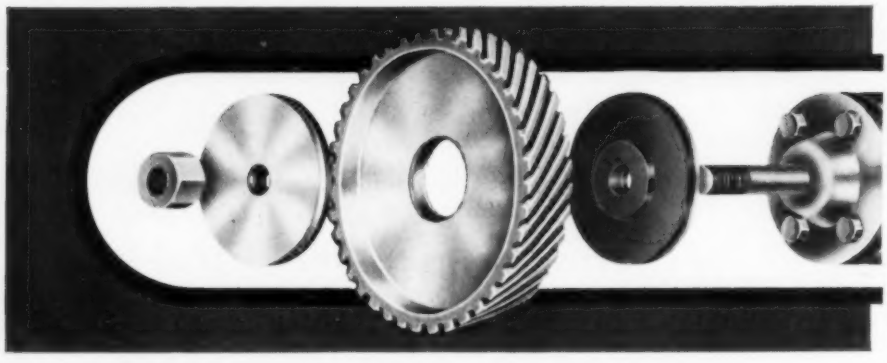
Because the contact wheel is not the driving wheel on the Tri-Matic, it is possible to use a smaller diameter in place of the regular 7" wheel. The 3" wheel reduces the arc of contact between the abrasive belt and the work, resulting in faster, cooler cutting. It has special advantages on such rough operations as descaling, heavy deburring, and stock removal.

The 3" wheel is furnished in a mounting which replaces the standard 7" wheel. The belt length is not changed, and the regular belts used with the 7" wheel are also used with the 3" wheel. These are available in various durometers to fit the requirements of different jobs and materials.

Sales Service Mfg. Co., 2363 University Avenue, St. Paul 14, Minn.

Use postpaid card. Circle No. 40

NEW! SELF ALIGNING LOW COST



Cosmo Contact Wheels WITH
COSMO-ALIGNER FLANGES

- ELIMINATES VIBRATION
- QUICK INSTALLATION
- FITS ALL WORN SHAFTS
- INCREASES PRODUCTION
- MOST ECONOMICAL

Your present equipment will operate like new with these self-aligning, low cost, Cosmo-Aligner shaft flanges. They operate with smooth perfect balance on all types of worn shafts. Made of durable rubber cushions, vulcanized to the face of 1/8-inch steel discs. Eliminating vibration will increase the life of your belts and bearings, as well as produce a finer finish for your end product. Call or write today for further information.

R-100 AVAILABLE WHEEL SIZES
Width of Face

Dia.	Flange	1"	1½"	2"	2½"	3"	3½"	4"
6"								
7"								
8"	SHADED AREA INDICATES							
10"	SIZES AVAILABLE							
12"								
14"								
16"								

Flanges should be ordered with set of wheels.

RECOMMENDED USES FOR R-100 COSMO WHEELS

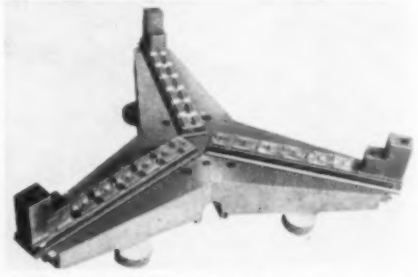
SIZES, DUROS and SERRATIONS TO MEET EVERY GRINDING and FINISHING NEED	R-100-PF	R-100-STD	R-100-SCOOP	R-100-59	R-100-E
	Soft duros for fine finishing in flat work or mild contour work.	1 to 1 land to groove ratio. General purpose wheel used in all duros.	1 to 2 land to groove ratio. Provides faster cutting and more aggressive stock removal.	1 to 2 land to groove ratio. Deeper serrations, increased flexibility, conforms best to unusual contours.	This is a slotted expanding wheel for bands only.

MANUFACTURED BY CHICAGO RUBBER CO., INC. FOR

Cosmo-Wheels, Inc. 1019 FULTON STREET CHICAGO 7, ILLINOIS

Use postpaid card. Circle No. 240

POSITIONING DEVICE



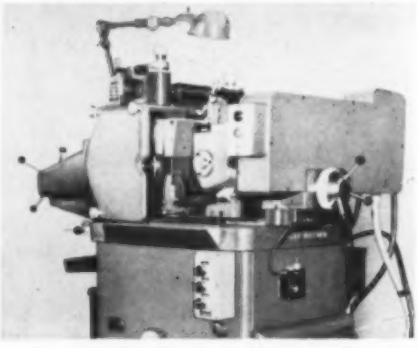
The standard size of a three-jaw, self-centering positioning device has a capacity from 3" to 40". Larger and smaller sizes are also available.

The unit's hardened steel jaws open and close at the turn of a wrench and work is automatically centered. The holding device is mounted on headstock, turntable, or positioner, and can be fitted with special jaws for special applications.

Skinner-Horton Chuck Division, New Britain, Conn.

Use postpaid card. Circle No. 41

CENTERLESS GRINDER CYCLES AUTOMATICALLY



A new high precision centerless grinder, Model CG-12-A, features high-speed automatic cycling with positive repeating action. It also can be operated manually. For safety, it can be returned to the "open" position at any stage of the grinding operation.

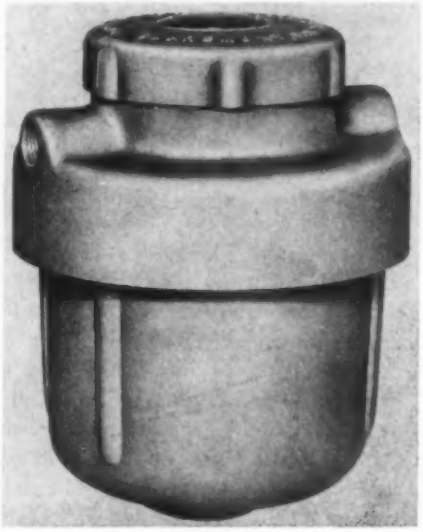
The unit can grind multi-diameter parts as well as balls out of stainless or carbon steel, glass, and plastic. It also grinds wood, non-ferrous metals, fibre, hard rubber, ceramics, and cork.

Among the special characteristics of this 30" and 54" grinder are: high output and fast checking with both sides of the wheel accessible from operation position; wheel dressers which can be mounted on casters for mobility; a massive heat-treated alloy spindle with ball bearings lubricated for life; and a regulating wheel spindle mounted between ball bearings to prevent deflection.

Royal Master Grinders, Inc., 272 Highway 23, Riverdale, N.J.

Use postpaid card. Circle No. 42

MAGNETIC OIL FILTER IS NEW, LARGER



Positive protection for oil hole drilling and reaming, tapping, threading, burnishing, and all types of lubrication systems is provided by Sinclair Magnetic Oil Filters.

The new No. 5 Model has a 5 gallon per minute capacity and incorporates all the advanced features of other models.

The filters can be installed easily and cause no pressure drop. Permanent magnets in the filter remove magnetic particles from oil, coolant, and other liquids, and they prevent damage from clogging to assure smooth finishes in machining operations.

Quick removal of a bucket held by a bayonet lock permits chips to be dropped when released by a control knob for the permanent magnet.

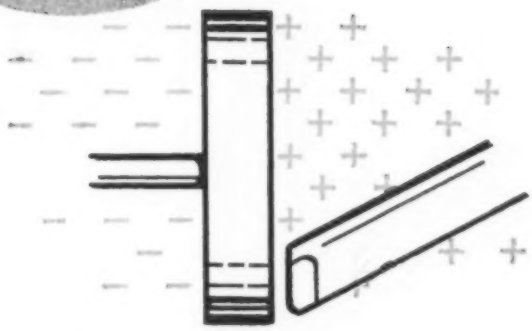
Sinclair Machine Products, Inc., Claremont, N.H.

Use postpaid card. Circle No. 43

PROVED BEST IN PLANT TEST

FOR ELECTRO-LYTIC GRIND-ING

STAR DUST METAL BONDED DIAMOND WHEELS



"Tests in our plant indicate that your Star Dust Diamond Wheels are best for electrolytic grinding."
A Company—Cincinnati

"Your Star Dust electrolytic Diamond Wheels have out-performed all others tested."
D Company—Detroit

Contact our Sales Engineering Dept. for further information and arrangements for free trial in your plant.

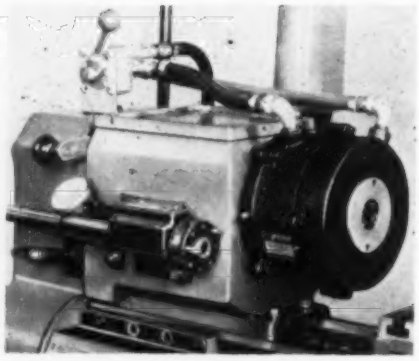
ACE ABRASIVE LABORATORIES, Inc.

Pioneer 6-3347
35 Roselle St.,
Mineola, L.I., N.Y.

Use postpaid card. Circle No. 241

CLOSES COLLETS WITHOUT STOPPING SPINDLE

Instant closing and releasing of flexible rubber collet chucks without stopping the spindle is now possible with the Airflex Collet Actuator. The complete unit, containing the actuator cylinder, spindle sleeve, and nose piece, threads onto a



2¼"x8' threaded lathe spindle without machine alterations.

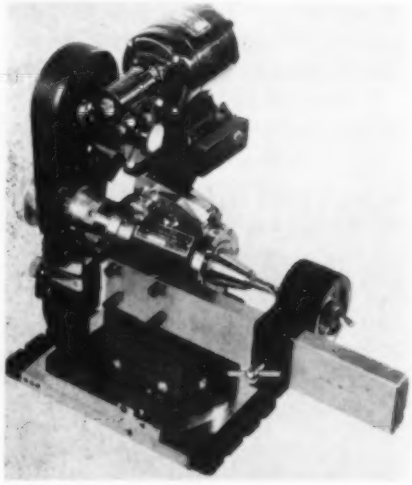
Chucks open or close instantly at full spindle speed. Positive length control is obtained by using a fixed stop in the hollow spindle.

No actuator bar is required. Full 1⅜" spindle capacity is available for feeding bar stock or for rapid ejection equipment. Over-all measurements are 7" O.D. x 4" long.

Wil-Numat Corp., 411 South Hickory, Inglewood 1, Calif.

Use postpaid card. Circle No. 57

HEAVY DUTY CENTER SUPPORT



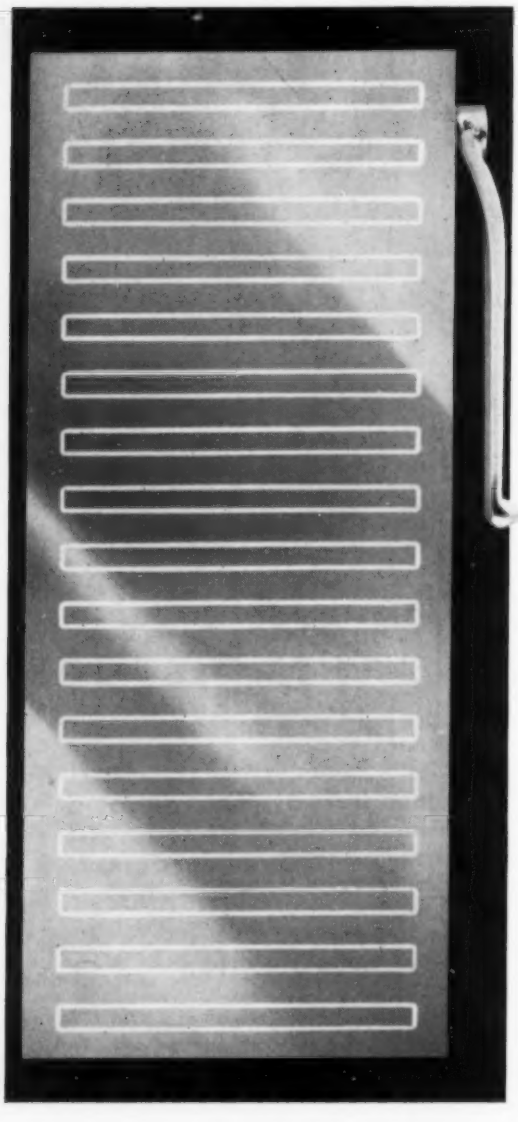
A new heavy-duty center support consists of a single bar with a 2¼" square inch cross section, practically eliminating any center deflection or distortion in grinding long tools.

Size and rectangular shape of the support provide maximum rigidity for supporting the extended center when tools are ground between centers, and for holding bushing type steady rest supports for long tools.

The new support is available only on new R-O fixtures when specified. Existing fixtures can not be properly converted.

R-O Mfg. Co., 31171 Stephenson Highway, Madison Heights, Mich.

Use postpaid card. Circle No. 58



KING SIZE!

You hold more work the safe, low-cost way with these big new Brown & Sharpe PERMANENT magnet chucks . . .

(10" x 30", 10" x 24", 12" x 24" sizes)

Now, Brown & Sharpe brings you *large* permanent magnet chucks that are as easy to operate as most small chucks.

You hold more work and larger work, with all these advantages of *permanent* magnet chucks . . .

No danger caused by power failure — No distortion from electrically-produced heat — No electricity and associated gadgets — Greater holding power — Lower cost — No upkeep.

Ask your Brown & Sharpe distributor to show you the new B&S *king-size* chucks! Brown & Sharpe Mfg. Co., Providence 1, Rhode Island.

Low contour, too!

Brown & Sharpe

PRECISION CENTER

Use postpaid card. Circle No. 242

"O.K., Harsfish! You know what I mean by wheel balancing!"

CUSTOM MANUFACTURED GRANITE SURFACE PLATES

An unusual line of custom manufactured granite surface plates for special precision measuring operations is being offered by the Herman Stone Company.

The plates are made-to-order in practically any size or shape that may be required. Only limiting factor is transportation facilities. The plates do not generally exceed 50 feet in length.

The larger size plates are available in Mt. Airy gray granite. Those up to approximately 16 feet long are also available in Balfour, Arabian, and Crystal Pink granites.

All are true quartz granites, containing about 25% to 30% quartz to assure long life and dimensional stability.

Herman Stone Co., 1869 N. Gettysburg Ave., Dayton 27, Ohio.

Use postpaid card. Circle No. 47

CONVERTS STANDARD UNITS TO ELECTROLYTIC GRINDERS

A complete line of power converters makes it possible to change any conventional grinder to an electrolytic grinding unit.

The converters are available in five standard models, with capacities from 250 to 150 amps. A single control permits the power pack to be quickly adjusted to the job in progress. Once set, the optimum amperage output rate is automatically maintained. This permits more than one grinder to be handled by each converter.

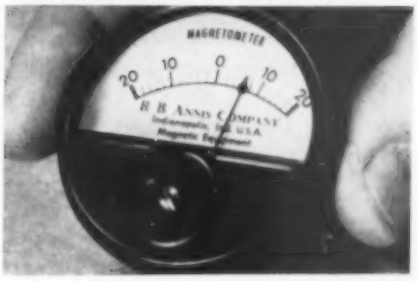
Other advantages include finishing between 5 and 12 micro inches rms, the elimination of burrs or lay-overs, and protection against spot-annealing during processing.

The converters are suited for precision grinding of carbides, honeycomb materials, super-hard stainless steels, high temperature alloys, stellite, titanium, hastelloy, and other exotic metals.

Hi-Carb Corporation, 1055 E. 260th St., Cleveland 32, Ohio.

Use postpaid card. Circle No. 48

SHOWS DEGREE OF RESIDUAL MAGNETISM

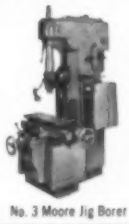


A new pocket instrument instantly measures the degree of residual magnetism in steel tools, parts, and structures.

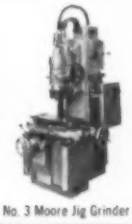
Known as the Annis Pocket Magnetometer, it readily indicates low residual magnetism levels required for good "fuzz free" parts cleaning. It can also measure and compare unusually strong magnetic fields by maintaining a known distance be-

MOORE ANNOUNCES UNPRECEDENTED 10-YEAR GUARANTEE OF MILLIONTHS' ACCURACY

Published Tolerances	
Longitudinal Travel:	
Greatest error in any inch	30 millionths
Greatest error in 18 inches	90 millionths
Cross Travel:	
Greatest error in any inch	30 millionths
Greatest error in 11 inches	90 millionths
Squareness:	
Compound slide	60 millionths
Full travel, spindle housing	90 millionths
Full travel, spindle	90 millionths



No. 3 Moore Jig Borer



No. 3 Moore Jig Grinder

10-year Deviation Guarantee	
Lead Screws	50 millionths
Quill fit, or clearance (Jig Borer)	20 millionths
Vertical slide fit, or clearance (Jig Grinder)	50 millionths
Compound slide squareness	20 millionths
Base ways	30 millionths
Table ways	30 millionths
Squareness of spindle to plane of travel	50 millionths

Moore can now, with confidence, guarantee the *accuracy-plus-durability* of hardened, ground and lapped lead screws and ways, plus the other locating features of its No. 3 Jig Borers and No. 3 Jig Grinders. Here's why:

The first No. 3 Moore Jig Borer built has now been operating in our toolroom for 5 years, an average of 2,300 hours per year. We have also inspected several other No. 3 machines in customers' plants. Our experience with hardened, ground and lapped lead screws now goes back 30 years. All of this history has provided us with sufficient data to project the performance of our No. 3 machines over a 10-year period.

As a result, we will now *guarantee* that the basic locating features of the standard No. 3 Moore Jig Borer and No. 3 Moore Jig Grinder will not wear or deviate in normal use *beyond published tolerances* over a 10-year period more than the specified amounts shown above.

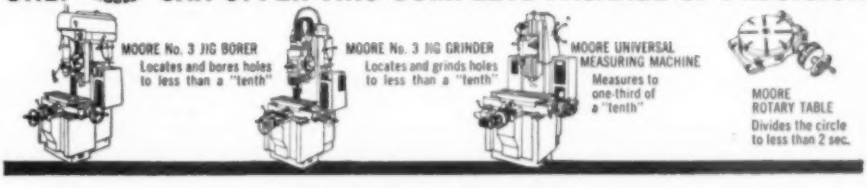
This guarantee is retroactive to include the No. 3 Moore Jig Borers and Jig Grinders already built and in use. It applies to original owners only, and is in addition to our unqualified 1-year guarantee.

You can call in our service man to check your machine at any time, at our regular charge. If this check reveals wear in excess of that specified above, we will correct the machine promptly at our expense.

Dick Moore

Richard F. Moore, President
Moore Special Tool Co., Inc.,
725 Union Avenue,
Bridgeport 7, Conn.
April 1, 1961

ONLY MOORE TOOLS CAN OFFER THIS COMPLETE PACKAGE OF PRECISION


MOORE No. 3 JIG BORER
Locates and bores holes to less than a "tenth"
MOORE No. 3 JIG GRINDER
Locates and grinds holes to less than a "tenth"
MOORE UNIVERSAL MEASURING MACHINE
Measures to one-third of a "tenth"
MOORE ROTARY TABLE
Divides the circle to less than 2 sec.

Use postpaid card. Circle No. 243

tween the instrument and the object being tested.

The instrument is particularly useful in work with hardened steel parts which are prone to pick up and retain magnetism from magnetic chucks, magnetized machine tools, etc.

R. B. Annis Co., 1101 N. Delaware St., Indianapolis 2, Ind.

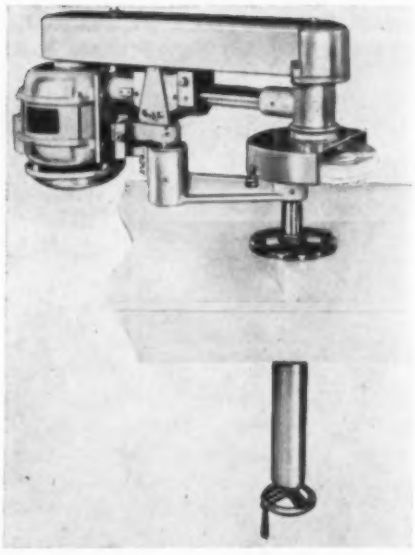
Use postpaid card. Circle No. 49

BENCH-MOUNTED FINISHING TOOLS

The bench-mounted finishing tools—the Flexi-Mount Belt Unit and the Flexi-Mount Wheel Unit—can be adjusted to any working height and angle.

Both are actually single heads taken from the Nash Multi-Spindle Rotary Finishers and adapted to operate independently. Each is entirely self-contained, including a 1 hp electric motor (3,400 rpm).

Simple flange-type mountings with high adjustment wheels make it easy to move the units from one



job to another. Once the flange receptacle is installed on existing machines, conveyor tables, or production lines, the electric cord is simply plugged into an outlet, and the unit is ready for operation.

J. M. Nash Co., 132 Jackson Street, Oshkosh, Wis.

Use postpaid card. Circle No. 50

CHECKS ACCURACY TO WITHIN 2 MILLIONTHS

The Electronic Comparator, Model 136B-2, checks master rings and discs to an accuracy within 2 millionths. It can measure inside diameters from .040" to 4.760" and outside diameters from 0 to 3.5".

These measurements are made with a constant gaging pressure, since the contacts are mounted on a free floating unit which eliminates friction. Two scales are immediately available by switching: 11,200X magnification and 2,200X magnification.

Federal Products Corp., Providence 1, Rhode Island.

Use postpaid card. Circle No. 51

NORTON TO MANUFACTURE TWO NEW MACHINES

Norton Company's Machine Tool Division will begin manufacturing two new machines used in the wafering and lapping of semiconductor materials used in solid state electronic devices.

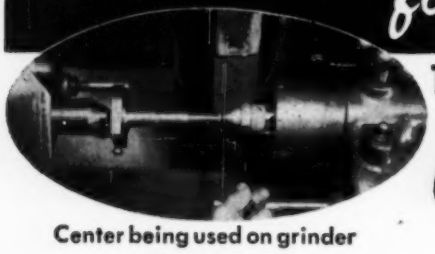
The Multi-Blade Wafering Machine is designed to cut approximately 300 wafers .010" thick from a single ingot in one operation.

The Four-Way Lapping Machine produces extra-thin wafers lapped to extremely close tolerance of thickness and parallelism.

Norton Co., Worcester 6, Mass.

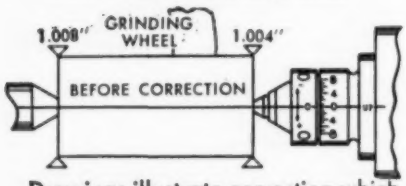
Use postpaid card. Circle No. 52

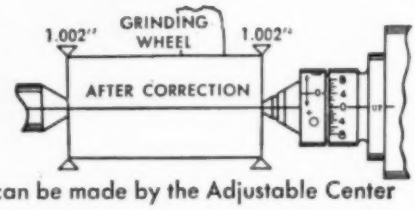
NEW . . . fast, easy CENTER ALIGNMENT for GRINDERS



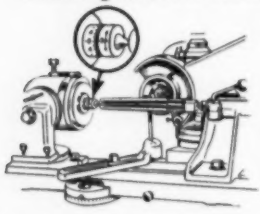
Center being used on grinder

The Erco Micro-Set® Adjustable Center

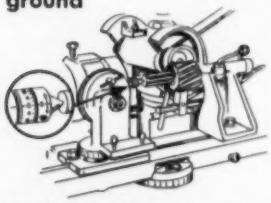




Drawings illustrate correction which can be made by the Adjustable Center



Taper reamer being ground



Helical milling cutter being reground

- Permits TRUE work alignment from tailstock or headstock on: cylindrical grinders, cutter grinders, gear shavers, lathes and tracer attachments.
- Saves one half the setup time.
- Ends hit or miss table adjustments to obtain precise alignment.
- An inexperienced operator can get a precise alignment—easily—in seconds.
- Quickly pays for itself in time and scrap savings.

MORSE TAPER
No. 2—$49.50, No. 3—$61.50, No. 4—$76.00.

BROWN & SHARPE
No. 6, 7—$53.00, No. 8, 9—$65.00, No. 10, 11—$85.00.

JARNO
No. 6, 7—$53.00, No. 8, 9—$65.00, No. 10, 11, 12—$85.00.

STRAIGHT SHANK
¾"—$56.00, 1"—$68.00, 1¼", 1½"—$80.00.

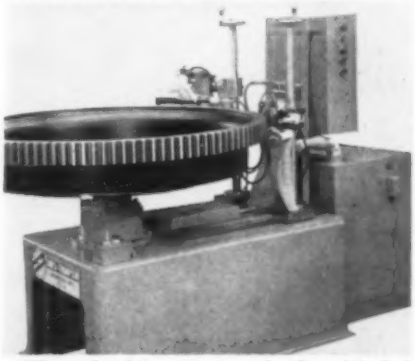
We also manufacture Precision Lathe Turrets and Tiny-Titan Magnet Base Holders.

Erco MANUFACTURING CO. Dept. 861, 4520 W. Fullerton Ave., Chicago 39, Ill.

Write for catalog and nearest distributor.

Use postpaid card. Circle No. 244

DEBURRS BOTH SIDES OF GEAR TEETH AT ONCE



The double arms of the Model DB-60 permit simultaneous deburring of both sides of gear teeth. The capacity of the machine is from 8" to 60" in diameter and up to 28" face.

A ½ hp variable speed drive rotates the work. Electronic control has a ratio of 25:1.

Settings can be preselected, and protractors and graduated scales are provided for easy and accurate setup. Guards over the grinding wheels act as intakes for the dust collector.

The work is placed in a horizontal position and there is no top housing or superstructure to interfere with handling of heavy work.

Davis and Thompson Co., 4460 N. 124th St., Milwaukee 18, Wis.

Use postpaid card. Circle No. 53

"MUSH" or "SLOUGH" FINISHING OPERATIONS

A new vertical oscillating attachment can be easily installed on Acme semi-automatic buffing machines to permit "mush" or "slough" buffing type finishing operations on recessed and contoured parts.

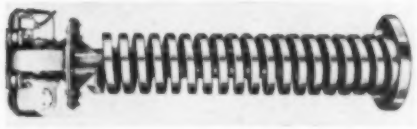
The attachment permits separate buffing operations to be combined into one operation. On large parts the oscillating stroke permits greater buffing coverage. On small pieces, fixtures can be arranged to hold more than one part at one time.

Mounted directly to the main spindle housing of Acme semi-automatic machines, the oscillating attachment simultaneously rotates the part and moves the part vertically above and below the center height of the buffing wheel to provide a greater part contact area. As the part travels vertically, the buffing wheel mushes into the recesses, depressions, and around the part contours to finish the required surfaces.

Acme Mfg. Co., 1400 E. Nine Mile Road, Detroit 20, Mich.

Use postpaid card. Circle No. 54

FEEDER DRIVE UNIT HAS LONGER STROKE



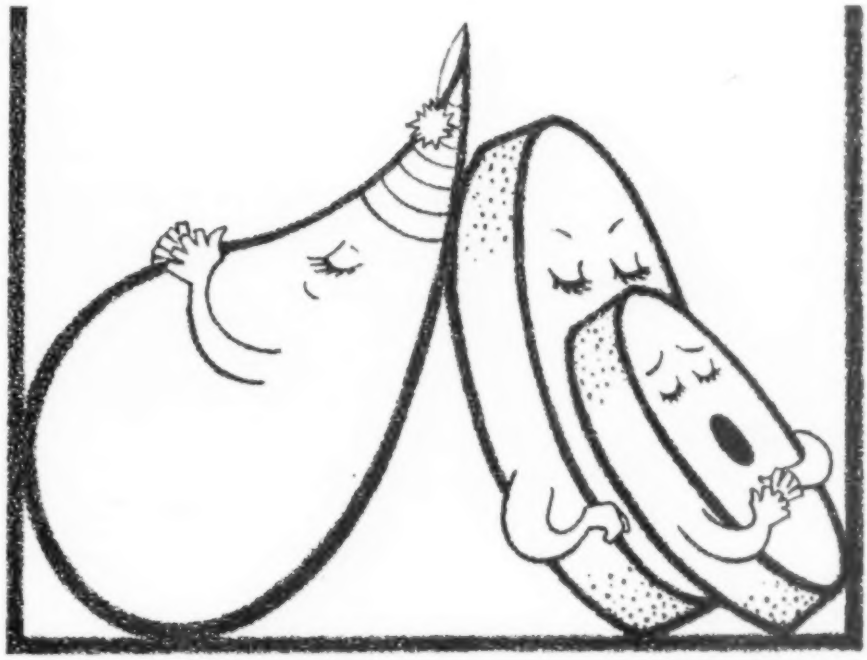
The Syntron Company's new spiral feeder is powered by a rotary vibrator drive unit which has a longer, more powerful stroke, enabling it to handle larger, higher spirals at greater capacities.

Among the uses of this unit are elevating metal parts from cleaning and degreasing tanks, and stampings from presses to tote boxes.

Three models are available with spiral heights from 3½′ to 20′. Syntron rotary vibrator spiral feeders operate on 230 or 460 volt, 60 cycle, three phase A.C.

Syntron Company, 1253 Lexington Avenue, Homer City, Pa.

Use postpaid card. Circle No. 55



Is a lazy coolant tiring out your wheels?

Do your grinding wheels loaf on the job, so to speak. Do they require frequent dressing because the coolant doesn't provide keen grinding action?

Do you get slower stock removal than you think you should, yet faster wheel wear — with finishes that are disappointing?

If so, switch to White & Bagley *lively* coolants. There's not an idle drop in a tankful of coolant.

W&B Chemical Concentrates help keep wheels open for fast grinding, minimum dressing, yet cost only about a penny per gallon of coolant.

W&B 1500 is recommended for grinding steel.

W&B E-55 is recommended for grinding steel, cast iron, non-ferrous metals.

W&B Lubricant 1888 gives longer wheel or tool life in grinding OR cutting. A high detergent, oil-type, water soluble concentrate.

W&B HD Soluble Oil 2213 prolongs wheel or tool life on tough jobs — gives heavy-duty support plus superior cooling.

W&B Grinding Oil 1572 sets the pace for the whole industry in critical grinding of threads, forms, gears.

Get the facts about LIVELY coolants, from:
The White & Bagley Co., 88 Foster St., Worcester, Mass.

W-B INDUSTRIAL LUBRICANTS

THE WHITE & BAGLEY CO.

Worcester, Massachusetts · Detroit, Michigan

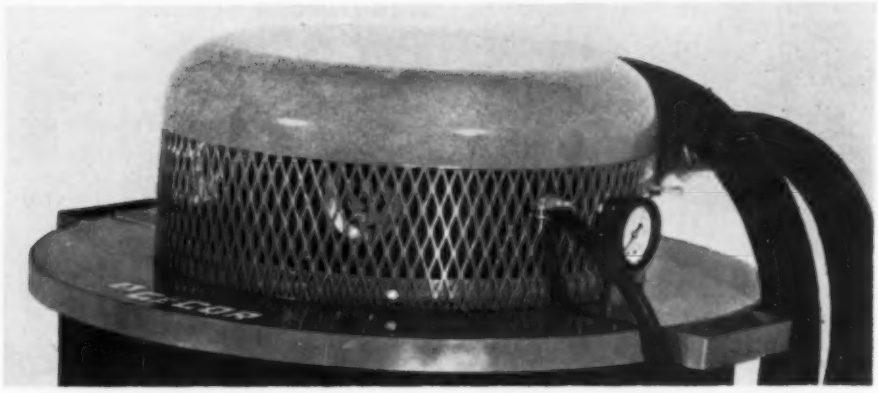
Originators of Grinding Lubricants

Use postpaid card. Circle No. 245

PUMPS COOLANT MUD FASTER

Pumping rate for removing coolant, chips, and sludge from machine sumps has been increased by the redesigned C°COR DLO coolant sump cleaner.

From 10 to 20 gallons per minute can be removed. A vacuum principle permits the most abrasive equipment to be handled without pump wear. The unit is mounted on a self-sealing lid which fits standard 55 gallon drums.



Coolant Equipment Corporation, Verona, Wis.

Use postpaid card. Circle No. 44

MICROMETER MAGNIFIER

The X5 folding micrometer magnifier is complete with measuring graticule included. It is designed to fill the gap between rough estimation with a scale and elaborate measurement. Field of view is one square inch. Scales are opaque white and reading accuracy is to .002".

Ealing Corporation, 2224 Massachusetts Ave., Cambridge, Mass.

Use postpaid card. Circle No. 45

DUST EQUIPMENT

A standard line of universal hoppers and stands for Dustkop dust collection units has a design based on the large variety of shapes and sizes of hoppers and stands that Aget has produced.

Any series Dustkop, when ordered without its standard bin, will fit any one of the hoppers and either stand.

Designed for maximum convenience in plant operation and servicing, the larger stand, No. HS-12, provides truck clearance beneath the hopper. The smaller unit, No. HS-10, provides adequate clearance for either tote truck or wheelbarrow.

Aget Mfg. Co., Adrian, Mich.

Use postpaid card. Circle No. 46

NOW... PRODUCE SATIN FINISHES 20 TIMES FASTER with a TIMESAVERS SPEEDBELT® SANDER

BRENNER METAL PRODUCTS CORP., BROOKLYN, N. Y. has slashed finishing costs by installing a Model TOP-18 and increasing output a tremendous 2000%. The job calls for finishing stampings used for metal boxes to a flawless satin finish prior to forming. Now, one Timesaver "Speedbelt" Sander does the work previously handled by 4 men with pad and stroke sanding machines . . . with plenty of open time for other work not originally planned on.

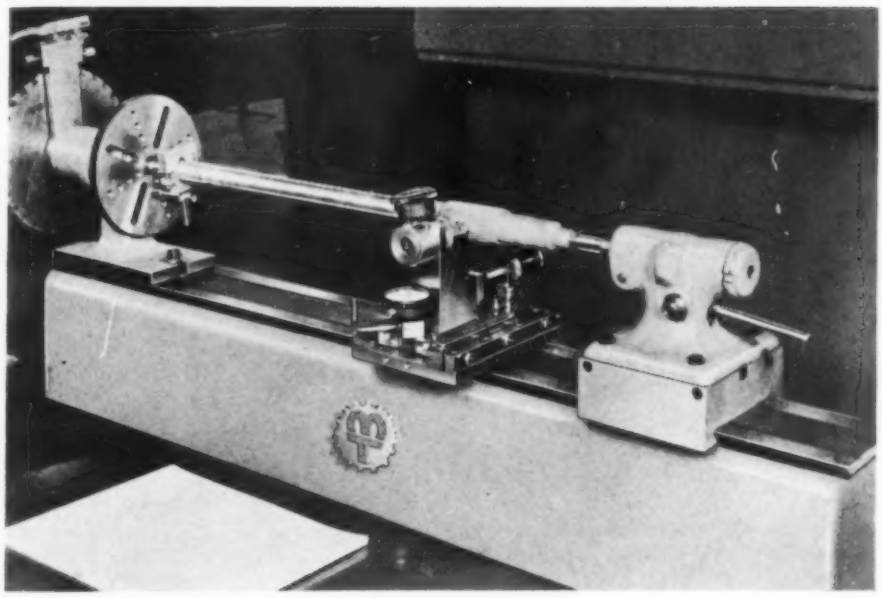
Investigate the advantages of Timesaver wide abrasive belt finishing for your plant. Write for fact sheet and literature today.

TIMESAVERS SANDERS, INC.

Dept. R-13
5270 HANSON CT.
MINNEAPOLIS 22, MINN.

Use postpaid card. Circle No. 246

SIMPLIFIES ANALYSIS OF TOOTH-SPACING TESTS



A simple tooth-space checking system that also graphically helps identify causes of tooth-spacing errors in straight or helical gears and splines is now available to industry.

The system provides a simple means of measuring pitch-line run-out and eliminating its effects on an index check. The inspection can be accomplished without the necessity for analysis by highly trained men.

A very short training session in the technique of the system enables the average machine operator to check toothed parts and accurately determine tooth-spacing errors.

Michigan Tool Co., 7171 E. McNichols Road, Detroit 12, Mich.

Use postpaid card. Circle No. 59

ADD SMALL, POWERFUL ELECTRIC HAND GRINDER

The Lesto GE/USL 33/1 electric hand grinder offers particular application in the manufacture of die-casting, stamping, and tooling.

With a power input of 250 Watts continuous, the spindle speed is 25,000 rpm at no load and 15,000 rpm under load. Up to 1" grinding wheels may be used.

Victor J. Krieg, Inc., P.O. Box 7, 1 Depot Plaza, Mamaroneck, N.Y.

Use postpaid card. Circle No. 60

ELECTROSTATIC CHUCKS FOR SURFACE GRINDERS

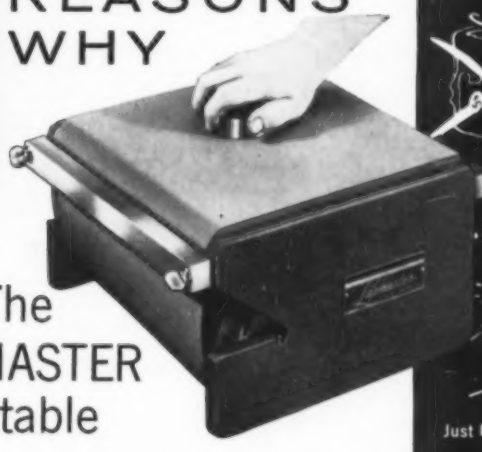
Electrostatic chucks, for use on rotary type precision surface grinders, are available in 6" and 11" sizes. The chucks may be used with or without center locating bushings.

They hold such non-magnetic materials as brass, copper, aluminum, stainless steel, beryllium, and also plastics when flashed with a conductive coating.

Electroforce, Inc., Fairfield, Conn.

Use postpaid card. Circle No. 61

4 REASONS WHY



The LAPMASTER Portable Polishing Stand *Simplifies Polishing*

Makes polishing much easier because it holds polishing paper taut and wrinkle-free . . . *always*. Provides replacement of worn paper with new section . . . *immediately*. Steel stage has been lapped to precision flatness to assure a perfect polishing surface . . . *forever*.

The Lapmaster Polishing Stand is ideally suited for polishing work pieces prior to inspection . . . in the experimental mechanical laboratory...and for small run polishing jobs.

No Adhesives . . . No Special Cutting.
Just Pull Out . . . for Replacement of New Polishing Surface.
No Looseness . . . in Polishing Surface.
Always Taut . . . Eliminates Dubbing of Work Edges. Large Capacity Chamber. Holds 50 Yd. Roll of Paper.

Lapmaster® DIVISION

Get further facts and details . . .
Write for copy of Bulletin L-410.

CRANE PACKING COMPANY
6417 OAKTON STREET
MORTON GROVE, ILLINOIS (*Chicago Suburb*)
In Canada:
Crane Packing Co., Ltd., Hamilton, Ont.

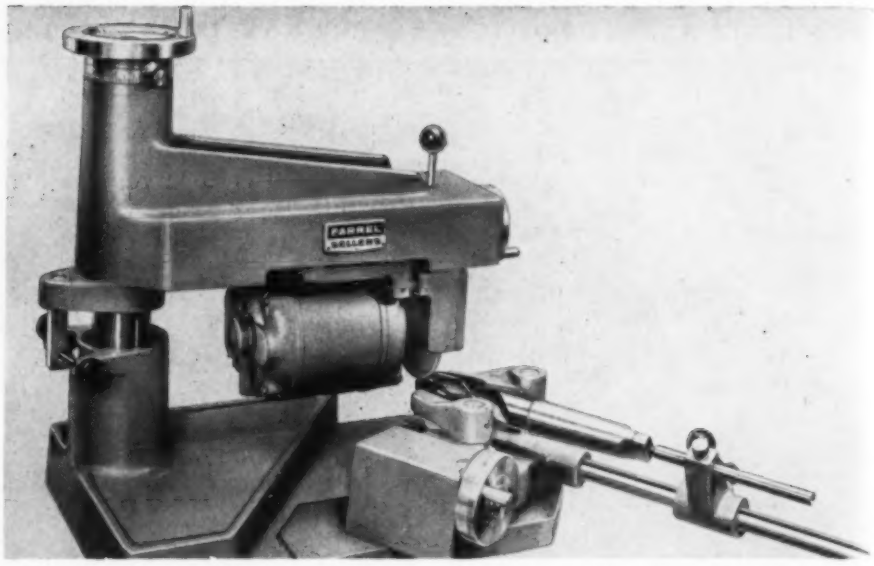
Use postpaid card. Circle No. 247

THINS AND CENTERS DRILLS ½"-3" DIAMETER, 24" LONG

The new Farrel-Sellers drill point thinning machine is a compact, bench type, self contained motor driven unit that will thin and center the points of ½" to 3" diameter drills in lengths up to 24".

The grinding wheel is mounted on the shaft of the motor, and it is set with relation to the axis of the drill to insure automatic concentricity of the web.

Jaws for positioning drills can be opened and closed quickly. One pair

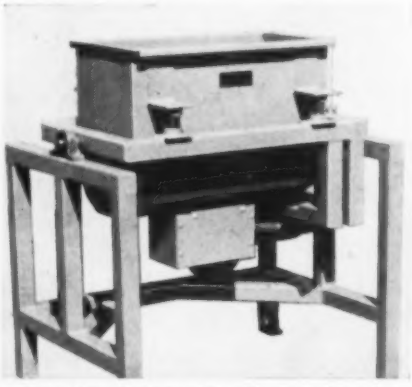


of jaws holds all drill sizes within the capacity of the machine.

Farrel-Birmingham Company, Inc., Consolidated Machine Tool Division, 565 Blossom Road, Rochester 10, New York.

Use postpaid card. Circle No. 63

FOR DEBURRING, DESCALING, POLISHING



The Model V-600 vibrator finisher deburrs, descales, and polishes small parts. It has a full two cubic foot capacity and comes equipped with a ¾ h.p. motor and capacitator.

The all-welded frame construction is of heavy steel. The barrel itself is poly-vinyl lined.

The unit is all ball-bearing mounted and is rubber cushioned for quiet performance.

Delta Mfg. Co., 1137 W. Hilton, Pheonix, Arizona.

Use postpaid card. Circle No. 64

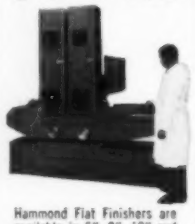
GRIND...POLISH...DEBURR in one operation with *Hammond* FLAT FINISHERS

For fast, uniform, economical finishing of flat work such as sheets, bars, strips, stampings and extrusions with one machine, one operator and one pass.

AUTOMATIC AIR TENSIONING: maintains correct tension on abrasive belts and conveyor belt • **VARIABLE SPEED CONVEYOR:** rate of feed is adjustable from 0 to 60 FPM • **WORK HOLDERS:** hold-down rolls, electro-magnetic platen and various types of conveyor belts • **AMMETER CONTROL:** an ammeter for each head allows operator to determine and maintain the polishing pressure necessary for a uniform finish and longer belt life • **V-BELT DRIVE:** allows abrasive belt speed to be changed to suit the work • **MICROMETER DIAL:** controls heads for required depth of cut.

Write for literature today.

1 TO 6 HEADS 6" to 12" WIDE



Hammond Flat Finishers are available in 6", 8", 10" and 12" widths — handle work up to 6" high.

SEND SAMPLES Send us one finished and several rough samples. You will receive a complete Engineering Report and Production Analysis without obligation.

Hammond Machinery Builders INC.

1651 DOUGLAS AVE. • KALAMAZOO, MICHIGAN

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UNPRECEDENTED GUARANTEE COMBATS FOREIGN COMPETITION

An unprecedented 10-year guarantee of accuracy, recently announced by the Moore Special Tool Company of Bridgeport, Conn., serves to emphasize the superior workmanship of American-built equipment over lower-priced imported machinery.

Moore is a leading producer of jig borers, jig grinders, and measuring machines used in tool rooms for highly precise locations.

The company is guaranteeing that the basic locating features of its standard No. 3 jig borer and No. 3 jig grinder will not wear beyond published tolerances over a 10-year period.

The guarantee, involving accuracies to the millionths of an inch, is retroactive and includes all Moore No. 3 jig borers and No. 3 jig grinders.

Announcement of the unique guarantee was made by Richard F. Moore, president of the Bridgeport firm.

"American machine tool builders can match the lower wages of foreign manufacturers only by standing firmly on superior engineering and workmanship," Moore said.

"This must be done by aggressive marketing of proven values," he added.

C. S. HALLAUER RECEIVES SAMA AWARD

Carl S. Hallauer (left), chairman of the board of Bausch & Lomb, Inc., receives 1961 award of the Scientific Apparatus Makers Assn. from Dr. George A. Downsbrough, SAMA president.

Carl S. Hallauer, chairman of the board of Bausch & Lomb Incorporated has been named winner of the Scientific Apparatus Makers Association's "Man of the Year" award. Hallauer accepted the award at the SAMA Conference, held at White Sulphur Springs, West Virginia.

Hallauer joined Bausch and Lomb in 1919 as manager of industrial relations. He became vice president in 1935, and president of the firm in 1954. He was named board chairman in 1959.

In presenting the 1961 award, SAMA President Dr. George A. Downsbrough said "The SAMA Award is given in recognition of leadership, accomplishments, and service—to the industry . . . to the progress of science . . . to the strength of the country.

"There is one further consideration, and that is the character of the man himself. During his career, he must have so lived as to win the sincere esteem and admiration of those who have had an opportunity to know him well."

STEEL INDUSTRY ORDERS ROD MILL ROLL GRINDERS

The American Steel and Wire Division of U.S. Steel and the Bethlehem Steel Company have placed orders with the Sheffield Corporation to design and build the steel industry's first machines to grind "passes" (circular grooves), in rod mill rolls. This work is currently done on lathes.

Grinding offers definite advantages. It permits use of harder metal, subsequently allowing more tonnage to be rolled before the grooves wear oversize.

$1.5 MILLION CARBORUNDUM PLANT IN MEXICO

The Carborundum Company has announced the construction of a $1.5 million abrasive manufacturing plant in Mexico by Carborundum Mexicana S.A., a recently organized firm owned jointly with Mexican interests.

Located in Toluca near Mexico City, the plant is scheduled to be in operation by late 1961. It will manufacture bonded abrasives and coated abrasive belts, sheets, discs, and rolls.

HEATED PLASTIC FORMS SMOOTH WHEEL BUSHING

Bushings of Carbo-Vitrobond, heated to 300° F and poured into precision grinding wheels in the last production process, are reported as superior to lead and fiber.

Carbo-Vitrobond makes a smooth, dense bushing which can be controlled dimensionally to close toler-

continued

ances, thus insuring proper fit to the machine arbor and reducing arbor wear.

A Sta-Warm 15 gal. tank and two 10-quart dispensers, electrically heated and thermosatically controlled, supply the "liquid" bushing material to be poured into the wheel. When the bushing has solidified, the wheel rolls from the line.

1961-62 MEETING DATES FOR ABRASIVE GRAIN ASS'N.

The following is a list of 1961-62 meeting locations and dates recently established by the Abrasive Grain Association:

Oct. 23-25, 1961—Fall meeting; Waldorf Astoria Hotel, New York City, New York.

April 16-18, 1962—Spring Meeting; Boca Raton Hotel, Boca Raton, Florida.

Nov. 7-9, 1962—Fall Meeting; Conrad Hilton Hotel, Chicago, Ill.

TIMESAVERS TO DOUBLE PLANT OPERATIONS

G. L. Schuster

Plans for more than doubling present plant size of Timesavers, Inc., Crystal, Minn., were announced by President Gordon L. Schuster. At the same time the firm announced a public stock offering to furnish capital anticipated for purpose of expansion, new machinery, and equipment.

Schuster said the company was offering 150,000 shares of common stock at $2.75 per share. Timesavers, Inc., has authorized capital of 570,000 shares with a par value of $.50 a share.

H. K. CLARK DIES; FORMER CARBORUNDUM PRESIDENT

H. K. Clark

Mr. H. K. Clark, president of the Carborundum Company from 1947 to 1953 and member of the Board of Directors from 1946 to 1959, died in his home at Washington, D.C., April 12.

Born in Gridley, Kan., in 1889, Mr. Clark was a graduate of Purdue University and the Armour Institute of Technology.

He joined the Norton Company of Worcester, Mass., as a trainee and rose to vice president and general manager.

After service with the government during World War II, he was elected a member of the Carborundum board in 1946 and its president in 1947.

NAME EARLEY FULLER MERRIAM VICE PRESIDENT

J. D. Earley

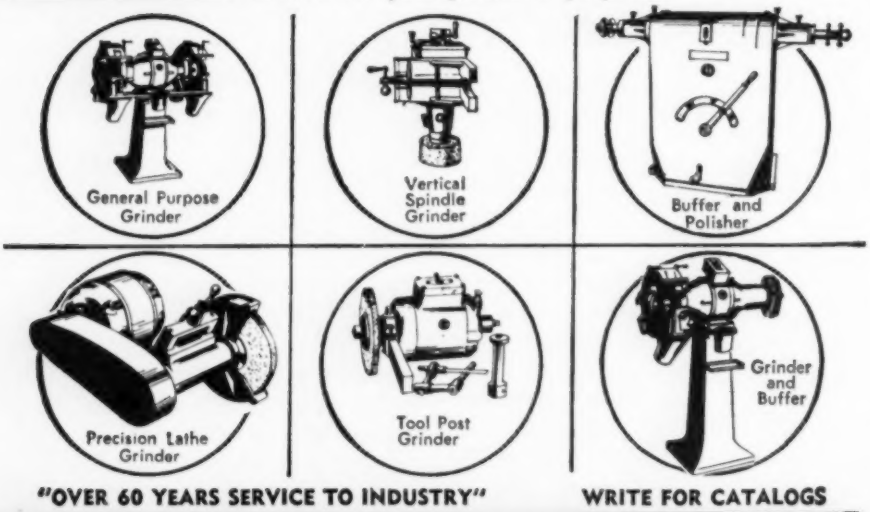
James D. Earley has been elected vice president of the Fuller Merriam Company. Widely known as an authority in grinding wheel application engineering, Earley started with Fuller Merriam in 1941.

After wartime service, he returned to the company and was later made customer service representative. In 1957 he became sales manager and has been responsible for development of the company's marketing program.

The Answer... TO INDUSTRY'S DEMAND FOR QUALITY, EFFICIENCY AND LOW COST ECONOMY

UNITED STATES ELECTRICAL GRINDERS-BUFFERS

An investment in better, faster, production through the use of tools expertly designed and conscientiously crafted for your particular purpose.



"OVER 60 YEARS SERVICE TO INDUSTRY"

WRITE FOR CATALOGS

The United States Electrical Tool Co.

3640 LLEWELLYN ST., CINCINNATI 23, OHIO

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Twenty-year certificates were awarded to nine sales representatives of Torit Manufacturing Co. at a recent general sales meeting. The veteran salesmen, shown here with two company officers have been with Torit's Industrial Division since it was formed 20 years ago to produce dust collectors. From left to right are: James A. Pennington; Walter H. Mackey; Arnold G. Landres; George F. Howe; Jay Achenbach, representing Kellogg Appliances Co. of Philadelphia; Robert E. Dyment; Robert Stoffregen, representing Wolverine Equipment Co., of Cambridge, Mass; Frank R. Chase, Torit vice president of sales; and William L. West, Torit president. Award winners not pictured are D. M. Duncan, of D. M. Duncan Machinery Co. Ltd., Canada; and E. E. McCarthy.

U.S.-AUSTRALIAN TRADE PROSPECTS BEING EXPLORED

The prospects of expanded trade between the United States and Australia in the machine tool and machinery fields were being explored in Sydney, Australia, in February and March.

Five American industrialists were appointed by the U.S. Department of Commerce to serve on a trade-building mission to Australia. During the 7-week visit, the Americans met and conferred with businessmen, industrialists, and provincial and government officials in Australia's key cities.

Primary purpose of the mission, in addition to its good will value, was to find and recommend ways of furthering trade activity between the two countries in specific areas of industry and commerce.

Members of the mission were Philip R. Marsilius, executive vice president of the Producto Machine Co.; R. M. Binney, vice president, First National Bank of Chicago; George A. Oldham, vice president, Pegues, Inc.; and William E. Vaugh, administrative division manager, American Can Co.

AMERICAN METALWORKING MACHINES SHOWN IN CEYLON

American-made metalworking equipment was demonstrated to the Ceylonese during a 30-day official United States Small Industries Exhibition which opened in Colombo, Ceylon, January 21.

continued

Now! see the NEW!
K. O. LEE GRINDERS
. . . the World's Most Versatile Grinding Machines!

The Model BA960 Universal Grinder is a result of over 30 years of experience in the manufacture of precision grinding machines, attachments and fine tools.

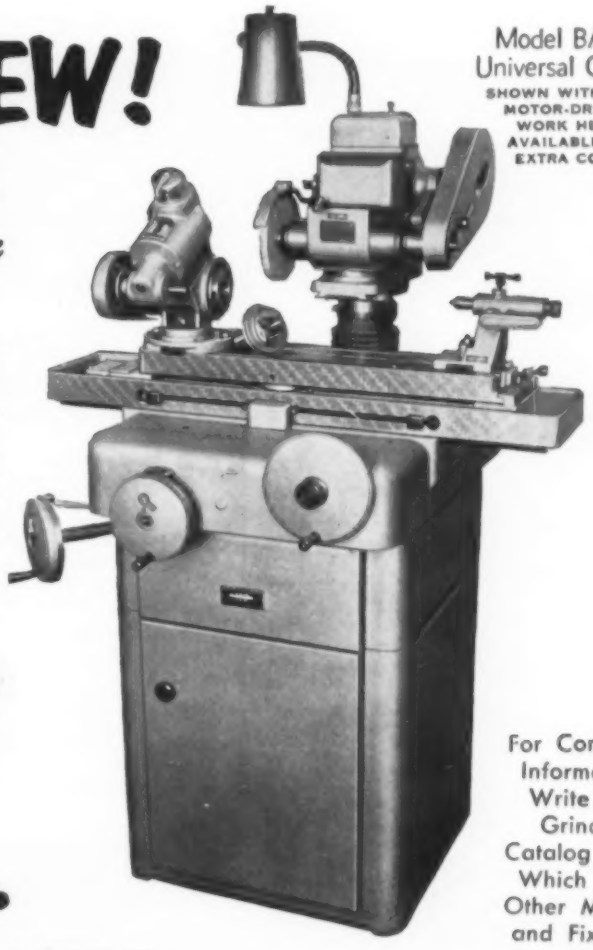
This machine is the biggest value in the industrial market. A truly universal machine, spindle speeds from 3450 to 20,700 RPM with standard equipment included, capable of handling all types of O.D., I.D. grinding operations demanded by the average shop.

K. O. Lee grinders have proven themselves year after year in the metal working industry. They have outsold all other grinding machines in their field.

We invite you to visit our Distributors. Compare this machine for quality, engineering, workmanship, sturdy construction and modern appearance against any machine on the market. See for yourself how much more you get for how much less you pay.

We believe that you will be pleasantly surprised.

K. O. Lee Co.
ABERDEEN, SOUTH DAKOTA



Model BA960 Universal Grinder
SHOWN WITH B943 MOTOR-DRIVEN WORK HEAD AVAILABLE AT EXTRA COST

For Complete Information Write for Grinder Catalog TG-1 Which Lists Other Models and Fixtures

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SAFETY BACKS

SAFETY FIRST

The accepted built-in safety standard developed by CARROLL — first source for Safety Backs, prong bushings, thin wheel inserts, etc.

Also designers of:
• All Steel Adaptor Pads • Throw-A-Way Hubs • Track Grinding Wheel Safety Backs • Heavy Duty Disc Wheel Inserts

Write for further information

SPECIALISTS IN ALL TYPES OF GRINDING WHEEL METAL INSERTS

CARROLL
PRESSED METAL, INC.
PM
133 DEWEY ST.
WORCESTER 10, MASS.

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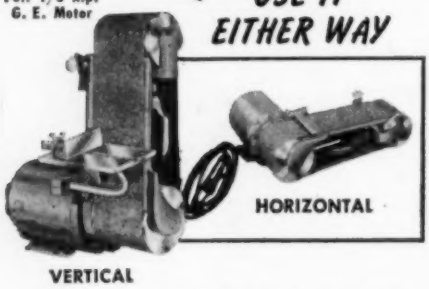
WALLS TU-WAY BELT SANDER

USE IT EITHER WAY

Full 1/3 h.p. G. E. Motor



At last, a top quality industrial sander that provides all the most wanted features — yet sells for so little.

complete with cord, plug, switch ready to use **$89.95**

Work table in vert. illus. optional.

Illustrated Literature on Request

A few desirable distributor territories still available.

WALLS SALES CORPORATION
59-63 Van Dam St. Brooklyn 22, N. Y.

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NEWS OF INDUSTRY *continued*

This exhibition is part of a larger industrial exhibition staged exclusively by the United States in Ceylon.

Part of the U.S. exhibit is a machine shop. Here, a pedestal grinder and other machines from South Bend Lathe Works, South Bend, Indiana, were demonstrated, with accessories from the Dumore Company, Racine, Wisconsin. Van Norman Machine Company, Springfield, Mass., has supplied a ram type milling machine.

Precision measuring was illustrated by an optical comparator from Jones & Lamson Machine Company, Springfield, Vermont, and by calipers and other devices from the L. S. Starrett Company, Athol, Mass.

Twenty-four U. S. firms in all participated in the metal shaping machine shop, and heat treating demonstrations.

American technicians set up the machines, but they were operated

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If you want to get a personal copy of GRINDING and FINISHING regularly . . .

GRINDING and FINISHING is regularly distributed to qualified users of abrasives at their company addresses.

The magazine is also available on subscription to anyone interested, user or not, as explained below. (Supplier member of the American Society for Abrasives may subscribe at a special rate of $4.50 per year.)

LOOKING AHEAD TO JULY

The following are several of many timely features which will appear in the July issue:

- Problems in Grinding Machine Knives
- Reducing Toolroom Set-up Time
- Air Force Research Report: Abrasive Machining of High Strength Materials

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Hitchcock Building, Wheaton, Illinois

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☐ Manufacturing ☐ Distributor
☐ Sales only ☐ Mfgrs. Rep.

Product Manufactured
_____

Number of Employees _____

Nature of Operation:
☐ Toolroom grinding
☐ Precision grinding
☐ Finishing operation
☐ Rough grinding
☐ Coated abrasive operation
☐ Abrasive grain operation
☐ Buffing and polishing

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Clearly explains modern metal cutting -- principles, mechanics, machining methods

In this book you'll find a wealth of information to help you specify or perform machining operations for higher production and lower costs. Presented here are important facts on what happens at and near the edge of the cutting tool where the chip is formed and the new surface created. You get detailed coverage of the cutting tool, the workpiece, the chip, and the cutting fluid.

In addition, the book thoroughly discusses such topics as the existence of the shear plane in metal cutting, functions of cutting fluids, and types of cutting tool materials. It helps you gain a sound working knowledge of such practical factors as lubrication, friction, and wear of the cutting tool as they affect the metal cutting process. Important advances in the field are covered—including the effect of temperature on wear, location of the shear plane, and newer tool materials.

THEORY OF METAL CUTTING

By PAUL H. BLACK

Professor of Mechanical Engineering, Ohio University

204 pages, 6 x 9, 105 illustrations, $7.50

With the helpful facts on the metal cutting process presented in this book you can more readily achieve better surface finish, rapid removal of metal, and effective machining practice. You are given information on the cutting tool, the workpiece, the chip, and the cutting fluid to help you choose an economical and efficient metal cutting process.

Clearly outlined in the book are established basic principles of both two- and three-dimensional cutting, and important features in machining operations of economic importance to the user of machine tools.

This practical guide provides you with data on surface irregularities and damage . . . criteria for evaluating machinability . . . the advantages of numerical control in machining . . . methods of treating surfaces of high-speed steel tools to reduce friction . . . and much more. Consult this book for clear explanations of the principles, mechanics, economics, machining methods of modern metal cutting.

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structure and strength of materials • mechanics of plastic flow and fracture • mechanics of metals cutting • the shear plane • force relations • basic principles of friction, lubrication, and wear functions of the cutting fluid • tool materials and types of failure • various types of wear • tool life as it affects the economics of the cutting operation • methods for measuring tool life • mechanics of grinding metal • types of grinding wheels • numerical control machining • conditions affecting cost of machining • experimental machining methods.

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by young Ceylonese college students, who gave running commentaries. This technique overcomes the language barrier.

These exhibits of metalworking were selected because they were well-suited to the theme of the exhibition: "Small Industries are Big Business."

GALLAND-HENNING COMPANY NAMES NEW PRESIDENT

Hermann A. Nunnemacher, formerly executive vice president, has been elected president of the Galland-Henning Mfg. Co., Milwaukee, Wisc. He succeeds his father, Henry J. Nunnemacher, president since 1917, who becomes chairman of the board.

Hermann Nunnemacher has been with the firm since 1937, the last 20 years as manager of the Nopak Products Division. He graduated from Marquette University in 1936.

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Changing Faces . . .

John V. McGuire is new general manager of Allis-Chalmers Pittsburgh Works. McGuire joined the company in 1940. He succeeds D. A. Griffith who had served in the post since 1954. McGuire has been assistant general manager of Pittsburgh Works in 1958.

Ronald J. Hurley is new general manager of the Acoustica division of Acoustica Associates, Inc., Los Angeles, Calif. As general manager of the division, Hurley is responsible for the research, development and production of ultrasonic cleaning equipment, liquid level gaging devices, and propellant utilization systems for the Atlas missile.

William I. Wilt, vice president-advertising and promotion, is vice president-marketing and directs Sheffield's domestic and export sales as well as continuing the direction of advertising and publicity.

Edgar Hakanson, assistant vice president since 1959 and Richard Chaney have been named marketing managers to assist Wilt. Chaney will concentrate on the export market and specific large volume products. Hakanson will handle large capital equipment marketing projects.

Harold H. Burrows, senior vice president rubber sales, has retired after 45 years of service with the Manhattan Rubber Division, Raybestos-Manhattan, Inc., Passaic, New Jersey.

Richard K. McKibbon and John K. Sjogren have been appointed to new positions in the Vibro-Equipment Division of Southwestern Engineering Co., Los Angeles. McKibbon is now chief engineer and Sjogren is product manager for SWECO Vibro-Energy grinding wheels.

James R. Miller was named to the post of production manager of SKF Industries, Inc.

Wendell H. Cheney has been named a field specialist by Norton Company's Abrasive Division.

Hartley Q. Torrison has been

H. Q. Torrison

named vice president and controller of the Standard Screw Company. Bernard A. Graham was elected to the board of directors. Torrison, who has served as controller since 1955, has been responsible for all cost and budget operations for Standard Screw's three divisions since 1946. His service with the company began in 1936.

K. Dale Swanson, formerly a Norton abrasive engineer in Salt Lake City, Utah, has been transferred to Los Angeles. He has been succeeded by Edwin R. Larson, former Los Angeles field engineer.

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Elwood F. Knapp

Elwood F. Knapp has been named vice president of manufacturing and a member of the board of directors of The Firewel Company, Inc., a wholly-owned subsidiary of The Aro Equipment Corporation, Bryan, O.

Wendell C. Fossman, Norton Company abrasive engineer, has been transferred to the New Jersey area as an abrasive engineer.

John W. Middekar, Jr., is now a direct field engineer for the diamond products of the Elgin National Watch Company's Abrasives Division. William R. Sundermann, has received the same appointment.

F. H. Gerlach

Francis H. Gerlach has been named vice president of engineering of the Porter-Cable Machine Co., Syracuse, N.Y. He joined the firm from the Han-Kor Co., of Cleveland, Ohio, where he served as president and general manager since 1958.

Allen Linderholm is in complete charge of engineering, research, and product development for the Dorsey Gage Co., Hyde Park, N.Y.

Edward K. Moffly has been appointed director of organic products for A. P. de Sanno & Son., Inc., Pheonixville, Pa. He will head up

E. K. Moffly

development work and processes in the manufacture of resinoid and rubber abrasive wheels.

Edward P. Fisher has been appointed finishing machine sales manager for the Osborn Mfg. Co., Cleveland, Ohio.

Louis J. Bauer, formerly a Norton abrasive engineer in the Memphis area, has been appointed a field engineer at the St. Louis district office. He will be succeeded in Memphis by Donald F. Clair.

Ralph Peek has been promoted to district sales manager of Elgin's Abrasives Division.

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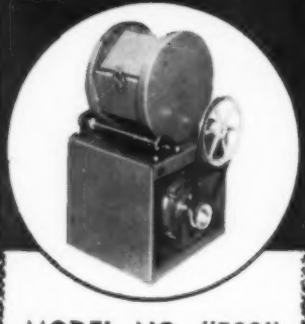

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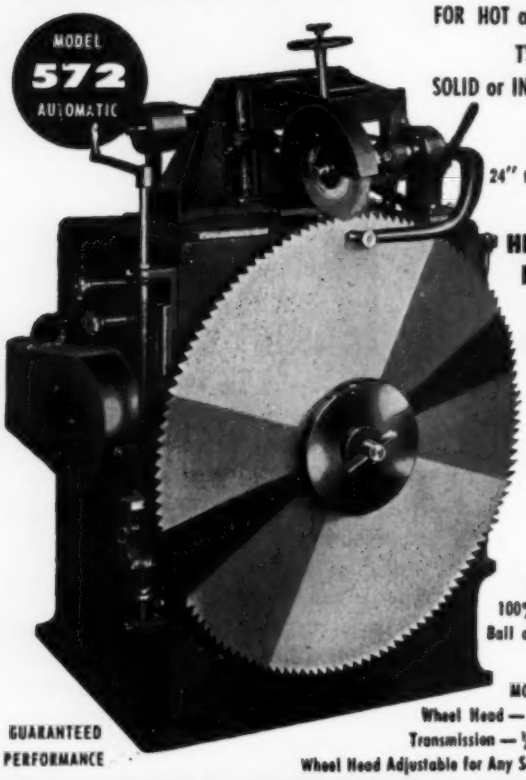

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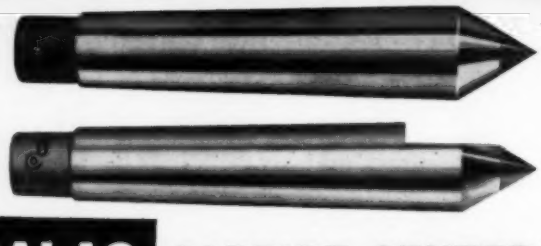

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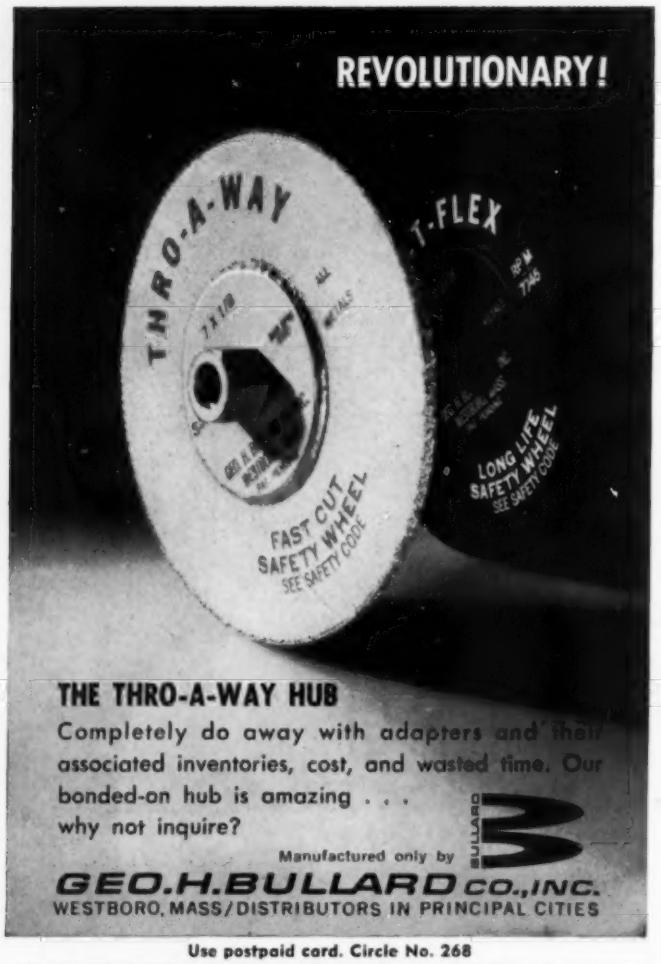

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ECONOMIC INSULARITY

Isolationism has been rooted from American ideology and no intelligent man wants to be draped with this bush. This is good and we can be thankful; however, when we root out one old bush we leave a hole, and holes, as we all know, must be filled. One can't leave a gaping hole in the landscape, can one? Have we substituted for isolationism another falseism as pernicious and deadly as the first? Have we substituted economic insularity?

By economic insularity, we mean thinking economically only in terms of our domestic economy and private prejudices and not in terms of world markets, world economic conditions, and the relation of individual demands to the whole. This type of narrow prejudice is the badge of the unions who think only of more pay for less work, whose only concern is with the welfare of the labor force. They are not bothered with what increased wages will mean to prices, the competitive situation, American industrial well being, or the consumer. Labor is a real sophomore in broad thinking. Thinking small, it does not relate wages objectively to the cost of goods, to world wide competition, world markets and industrial growth which, in turn, relates itself to employment and prosperity.

While our government is oriented to world-wide situations and cannot be isolationist in that regard, its economic thinking is naively insular. It doesn't equate the industrial health of the nation with world market conditions. While it says world trade is a two way street and tariffs are not good, with which we wholly agree, the government does not provide the climate in which industry operates competitively to meet the problems brought about by the free flow of trade. Sometimes it appears that government, under the leadership of bushy-tailed theorists, is deliberately determined to hack business down. While all is being done to pamper labor, the farmer and vested interests, nothing is being done to encourage industry to be strong and productive. The thinking of too many government theorists is oriented to do-goodism; their economic thinking is tied to the kite of sociological progress. This is not even thinking in terms of economic insularity, it cannot be considered thinking at all, pipe dreaming is a better word.

While we may regard this as a frustrating situation, reflect on the many able government executives who are aware of this problem and who battle valiantly, day after day, amid a thousand frustrations, that their voices might be heard.

Business, too, in many areas suffers from the same malady. While complaining about imports, is it making determined moves to export and capture foreign markets with better products at lower prices? Doesn't all the world hold many American products in high esteem and clamor for them? Isn't the world industrialization movement triggered by this vision: If Americans have two cars in every garage and two chickens in every pot, why can't we? Is business supplying the washing machines, refrigerators, vacuum cleaners and other consumer products? Business suffers here from economic insularity in its thinking.

After all is said and done, might we not say, our thinking is small when it should be big; it is narrow when it should be broad; it is greedy when it should be progressive?

Wm. F. Schleicher

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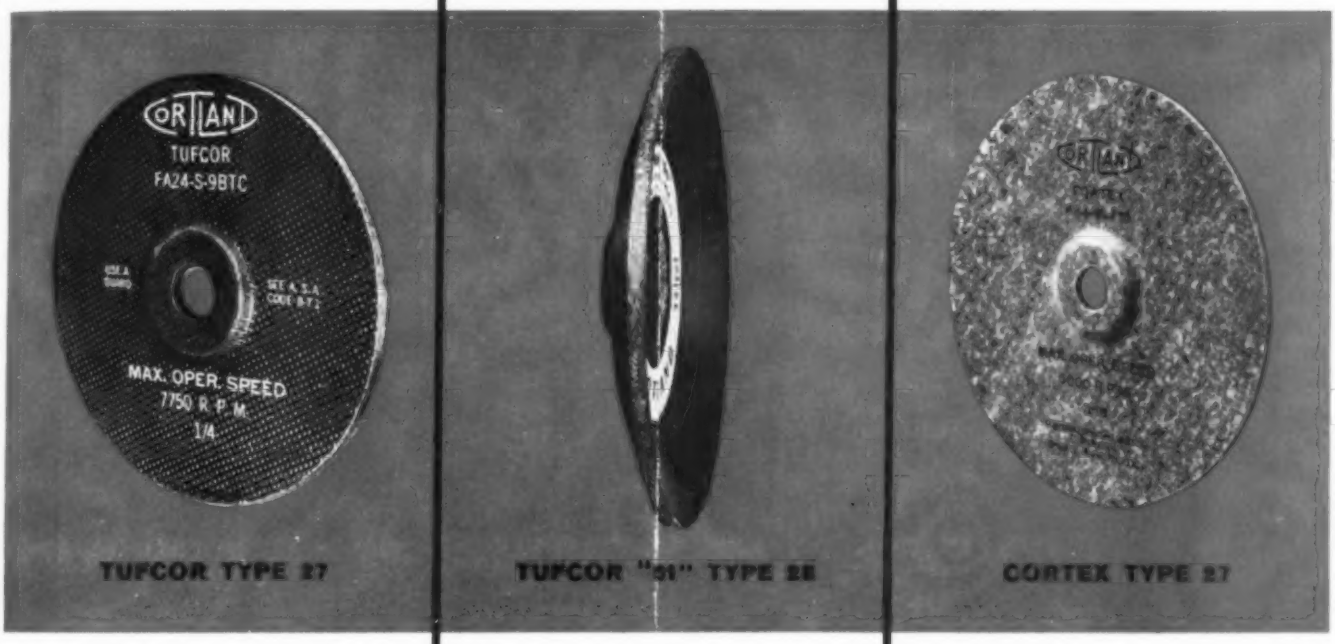
GENERAL RECOMMENDATIONS FOR RIGHT ANGLE PORTABLE GRINDERS



TUFCOR TYPE 27 | TUFCOR "51" TYPE 28 | CORTEX TYPE 27

SIZES

Diameter	Thickness	Hole	Specifications
3"	1/8" or 3/16"	3/8"	FA24-S-9BTC
7" or 9"	1/8", 3/16", 1/4" or 3/8"	7/8"	FA24-P-9BTC

APPLICATIONS

1/8" thickness for slotting, notching, cutting off gates and risers and light weld removal. Other thicknesses (your choice) for heavy duty work, removing weld bead, snagging and smoothing large surfaces. Use "S" grade on soft steel, "P" grade on stainless steel and tough alloy metal welds.

SIZES

Diameter	Thickness	Hole	Specifications
7"	1/4"	7/8"	FA24-S-9BTC FA24-P-9BTC

APPLICATIONS

Used on same basic jobs as Tufcor Type 27. Better suited for large flat areas. Can be used effectively in place of type 11 cup wheels. Use "S" grade on soft steel, "P" grade on stainless steel and tough alloy metal welds.

SIZES

Diameter	Thickness	Hole	Specifications
7" or 9"	1/8", 3/16", 1/4" or 3/8"	7/8"	A24-M-F10

Also available in 16, 36, 54, 80, 120 and 320 grit.

APPLICATIONS

For thin sheet metal welds, light stock removal, blending and polishing. The wide range of grain sizes offer a choice of finishes desired.

TYPE 1 (Straight) wheels are available in both Tufcor and Cortex for all portable grinders.

CORTLAND

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Chester, Massachusetts

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